ELECTRICAL WORLD

A McGRAW-HILL PUBLICATION

SEPTEMBER 24, 1949

ELECTRICAL WORLD 1874 1949 OUR 75TH YEAR

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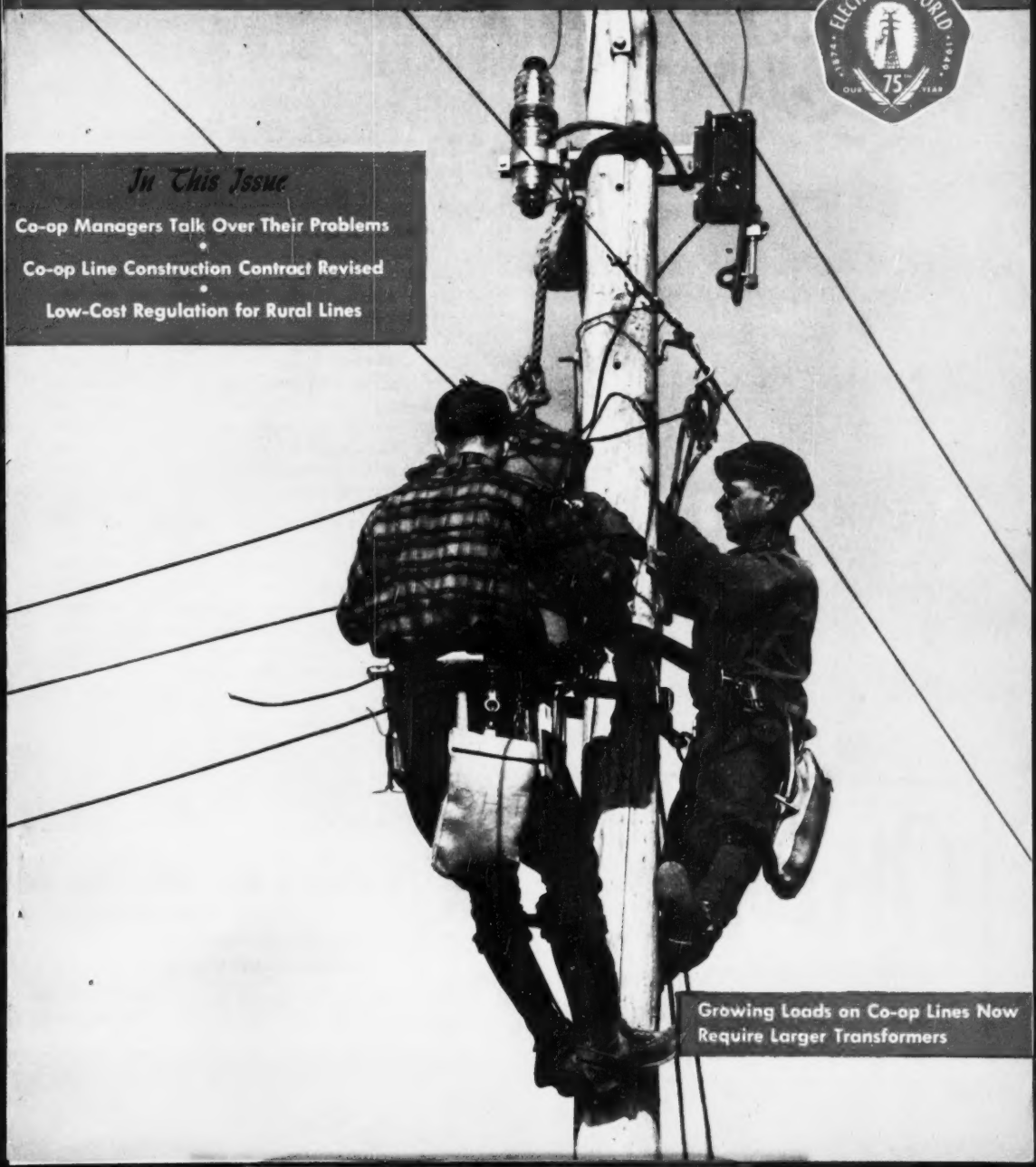
Co-op Managers Talk Over Their Problems

•

Co-op Line Construction Contract Revised

•

Low-Cost Regulation for Rural Lines



Growing Loads on Co-op Lines Now Require Larger Transformers

THIS MAN WORKS *Faster Better Safer*

Because the

Murray CROWS'NEST

affords FIRM, SURE FOOTING
PROPER HEIGHT
WIDE REACH
COMPLETE ROTATION

plus— **The Unmatched *Safety* of Non-Metallic Construction and Semi-Automatic Operation**

Steadier . . . stronger . . . safer — that's the Murray demountable Crows'nest, the world's most versatile aerial maintenance ladder. Use it for servicing street lights, inspecting overhead lines, trimming trees, connecting service entrance cables, restoring service when lines go down. Easily operated by only one man, yet strong enough to support ten . . . steady as the truck chassis itself . . . with the inherent safety around high voltage wires that only wood construction achieves!

Murray Crows'nest aerial ladders are available in working heights of 26, 28, 30, 32, 35, 40, 45 and 50 feet. (Ladder at left is the 40 foot size.) They can be mounted on any ¾ ton (or larger) truck weighing 2700 pounds or more. To free the truck for other work, the entire assembly is demounted by removing a single bolt. Write for descriptive bulletin.

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50 Years of Service to the Electrical Industry

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Cable Racks — Cable Protectors
Manhole Wall Inserts
Aluminum Meter Sockets
Padlock Seals — Disconnect Plugs
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SERVICE ENTRANCE & METER EQUIPMENT • MAGNETIC CIRCUIT BREAKERS
SWITCHES • CURRENT LIMITING REACTORS • CROWS'NEST AERIAL LADDERS

ELECTRICAL WORLD

Published for 75 years for those engaged in the business of generating, transmitting, distributing or applying electric power

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ELECTRICAL WORLD, Published weekly by McGraw-Hill Publishing Company, Inc. Publication Office, 99-129 North Broadway, Albany 1, N. Y. Editorial and Executive Offices, 330 West 42nd St., New York 18, N. Y. James H McGraw (1860-1948), Founder; James H McGraw, Jr., President; Curtis W McGraw, Vice President and Treasurer; Eugene Duffield, Senior Vice President, Publications Division; Nelson Bond, Vice President and Director of Advertising; J E Blackburn, Jr., Vice President and Director of Circulation; Joseph A Gerardi, Secretary. Subscription rates: Single copy 35 cents. In the United States, $6 a year, $9 for two years, $12 for three years. Canada, $7 for one year, $11 for two years, $14 for three years. (Canadian money at par.) Pan-American countries, $15 for one year, $25 for two years, $30 for three years. All other countries $20 for one year, $30 for two years, $40 for three years. Entered as second-class matter, November 16, 1936, at the Post Office at Albany, N. Y., under the Act of March 3, 1879. Printed in U. S. A. Copyright 1949, by McGraw-Hill Publishing Company, Inc. Permission required to reproduce any of contents. Cable address McGRAW HILL, New York. Member ABP Member ABC

in hotels...

and in cables...

"LONG LIFE IS THE TRUE PROOF OF *Service*"*

*motto of HOTEL GIBSON, CINCINNATI, celebrating 100 years of hospitality

36 YEARS OF SERVICE is the record of these Okonite cables. Despite puncture in conduit—which was apparently made with a star drill at least 25 years ago—the cables continued to function perfectly although jammed in conduit at that point.

▶Dedicated to "that extra service which means so much," Cincinnati's famous Hotel Gibson this year celebrates its 100th Anniversary. Its motto: "Long life is the true proof of service."

In connection with its anniversary, the Hotel Gibson recently made certain wiring changes, necessitating pulling out an amount of the old cable, installed in 1913. Examination showed the cable to be Okonite—in such good condition that it will be re-used.

> *"Notice how pliable the rubber insulation still is and how it adheres to the well-coated conductor," writes Superintendent Albert Buenger, of the Hotel Gibson. "Conductors, insulation and braid are still in excellent condition. The appearance of this 36-year-old cable is such that anyone would say it had only been recently manufactured. We are planning to use it over again where lengths are suitable, and tests show we'll make no mistake doing so."*

Yes, long life *is* the true proof of service—in cables as well as hotels. The performance record of these and many other Okonite wires and cables proves that using the best cable is always your best policy—and especially in these days of high installation costs. You can get full information on the time-tested features of Okonite insulated wires and cables by writing to The Okonite Company, Passaic, N. J.

THE BEST CABLE IS YOUR BEST POLICY

OKONITE SINCE 1878 *insulated wires and cables*

HOW SAFE

CAN YOUR LINEMEN BE?

All-over Protection

Your linemen are no safer than their equipment makes them. For surer protection, provide them with Salisbury rubber line hose, insulator hoods, protective blankets . . . rubber coats, gloves, and sleeves. Graybar has distributed these and other Salisbury safety accessories for many years. Linemen trust them.

HOT-LINE TOOLS

Graybar offers Chance hot-line maintenance tools individually or in complete sets. They incorporate the latest developments in equipment for repairing energized lines. Metal fittings are lightweight, strong, heat-treated aluminum alloy. Poles are laminated spruce. We can provide you with specialized tools of various types for performing all hot-line jobs safely and efficiently.

First for First-aid

Linemen's first-aid kits must be weatherproof, dustproof, easy to handle, and complete in the supplies they might need. That's why the M.S.A. kits available from Graybar are favorites. In addition to 10-unit and 24-unit all-weather kits, Graybar distributes pocket-size M.S.A. first-aid packets.

NEAR YOU

There are stocks of some pole-line safety equipment at a Graybar warehouse near you. You can also get prompt delivery of many other pole-line items such as safety straps, hand tools, and specialized construction tools. Let your local Graybar Representative give you specific information about them. For special help on any problem "from the bottom of the hole to the top of the pole", talk with a Graybar Outside Construction Specialist. *Graybar Electric Company, Inc. Executive offices: Graybar Bldg., N. Y. 17, N. Y.*

4952

IN OVER 100 PRINCIPAL CITIES

Announcing a superior Fiberglas Insulation at a price comparable to Cotton

BH "649"

Here is a new Fiberglas Tubing and Sleeving with superior physical and dielectric properties *at a price comparable to ordinary cotton-base or rayon-base insulations.*

BH "649" is non-burning, non-fraying, non-stiffening . . . but above all it's the toughest insulation we have ever made. No varnish to crack or flake off. Toughened against the rough treatment encountered in assembly or product use. It is no longer necessary to specify an insulation grade with a rated dielectric strength substantially in excess of voltage requirements to insure against expected dielectric loss in assembly and service. Test the ability of BH "649" to maintain its rated dielectric strength and save the extra cost.

Production samples in any size, grade or color are available on request. Use coupon below.

BENTLEY, HARRIS MANUFACTURING CO., CONSHOHOCKEN, PA.

KNOT IT . . . Take a length of BH "649". Knot it. Pull it as tight as you can. Twist it. Then loosen the knot. There is no cracking. No change in the dielectric strength.

RUB IT . . . Take a length of BH "649". Hold the ends firmly. Then rub the sample up and down briskly in a sawing motion against the edge of a desk or chair. See how difficult it is to damage the coating.

HOLD A MATCH UNDER IT . . . Take a length of BH "649". Hold a lighted match under it. BH "649" will not support combustion.

BH *Fiberglas** SLEEVINGS

COUPON

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I am interested in BH "649" Fiberglas Tubing and Sleeving. Send samples for production testing of Grade_____ in sizes as follows_____ for_____ operating at temperatures of_____ °F at_____ volts.
(size or I.D.) (product)

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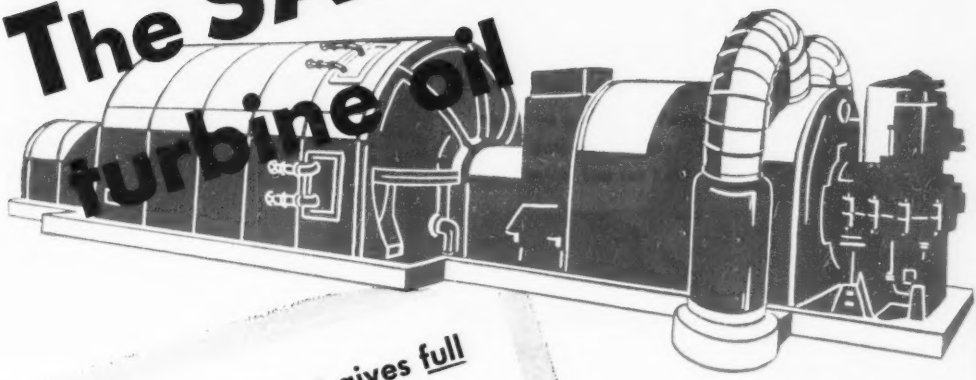
Send samples, pamphlets and prices on other BH Products as follows:

☐ Cotton or Rayon-base Sleeving and Tubing

☐ BH non-fraying Fiberglas Sleeving

The SAFEST turbine oil



. . . is the oil that gives full protection against sludge, rust and foam. Use Texaco Regal Oil (R&O).

OPERATORS using *Texaco Regal Oils (R&O)* have an extra margin of safety because—1) powerful inhibitors protect against the formation of rust and sludge, and 2) special processing checks foaming. Result: turbine lubricating systems stay clean . . . bearings get full lubrication at all times . . . governor action is instantly responsive.

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FOR ALL TURBINES

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Withstands heat, cold, moisture and aging
Neoprene is not thermoplastic; heat won't cause it to flow on wire and create thin spots
Neoprene resists smoke and chemical vapors, weather, sunlight and ozone
Withstands oils, greases, abrasion, cutting and chipping

Even in areas where conditions usually make short work of ordinary weatherproof wire, you can count on this new type for long, dependable service life. The reason: it's made with a seamless cover of tough, durable Du Pont neoprene. Neoprene's outstanding combination of properties offer the kind of protection needed most for all kinds of exposed wire . . . assure a tough armor that's little affected by conditions that cause most wire failures. That's why you'll find on your job that *it pays to specify a neoprene jacket for wire and cable.*

Du Pont manufactures neoprene in crude form only, and does not make finished neoprene products. But we'll be glad to help you with your problems and find you an adequate source of supply for neoprene-jacketed wire and cable. Write: E. I. du Pont de Nemours & Co. (Inc.), Rubber Chemicals Division G-9, Wilmington 98, Delaware.

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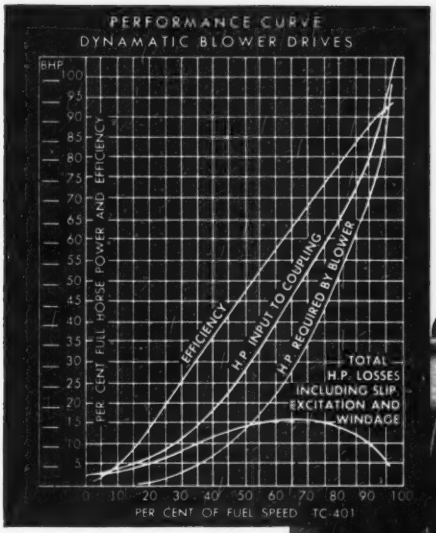
BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

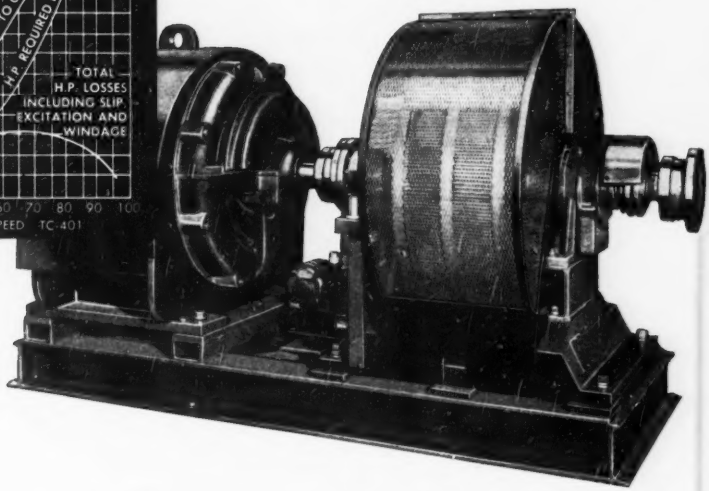
Specify wire and cable jacketed with

NEOPRENE

The rubber made by Du Pont



EATON DYNAMATIC BLOWER DRIVES



Instantaneous Response to Speed Control

Dynamatic Variable Speed Couplings are ideally adapted to such applications as regulating air drafts in steam generating stations, power house fan drives, public utility induced draft fans, and forced draft fans. Controls can be made to change the output speed of the coupling and hold that speed constant. Response is instantaneous and load changes are closely followed. The speed range available is practically infinite, and can be controlled precisely from ten per cent speed up to full speed.

The performance curve above indicates the characteristics of Dynamatic couplings when driving fans or blowers. Fundamentally, all fans and blowers will have curves very close to the ideal curves shown in this figure. Note the desirable relationship between efficiency, horsepower input, and required horsepower. The horsepower losses indicated are normal for this type of application. Both air cooled and water cooled types of Dynamatic couplings are available, selection depending upon loads and type of service involved. The electric-slip coupling was developed and introduced by Dynamatic; this company has pioneered the use of electric-slip couplings in fan and blower drive applications. Write for illustrated literature.

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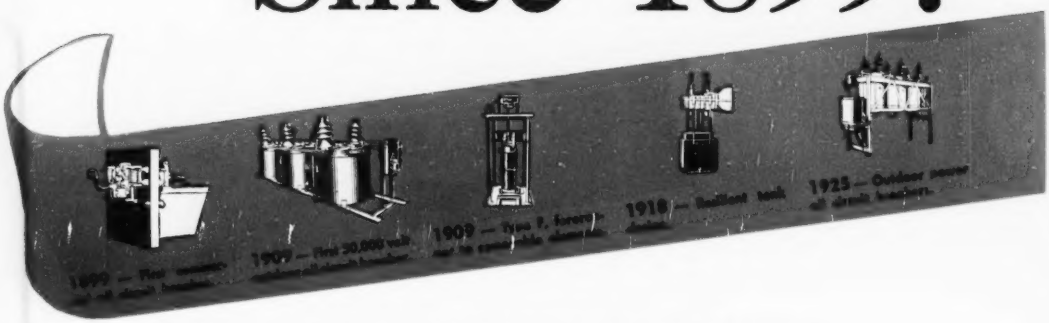
Building Power Circuit Since 1899!



New ASA Ratings up to 230 kv, 7,500,000 kva Typify Allis-Chalmers 50-year Progress Toward Increased Interrupting Capacities, Higher Operating Speeds, Lower Cost Maintenance.

FIFTY YEARS OF PROGRESS in any industry is an accomplishment. In power circuit breakers it represents the *entire history*. For in 1899 the first commercial oil circuit breaker for Central Stations was built, in what is now Allis-Chalmers Boston Works.

Since then many milestones of design progress have been covered. Today, Allis-Chalmers offers you a complete line of both indoor and outdoor breakers, designed and built to meet *today's* exacting standards.

Whatever your particular power circuit breaker requirements, an Allis-Chalmers sales representative will be glad to call and discuss them with you. District Offices located in all principal cities.

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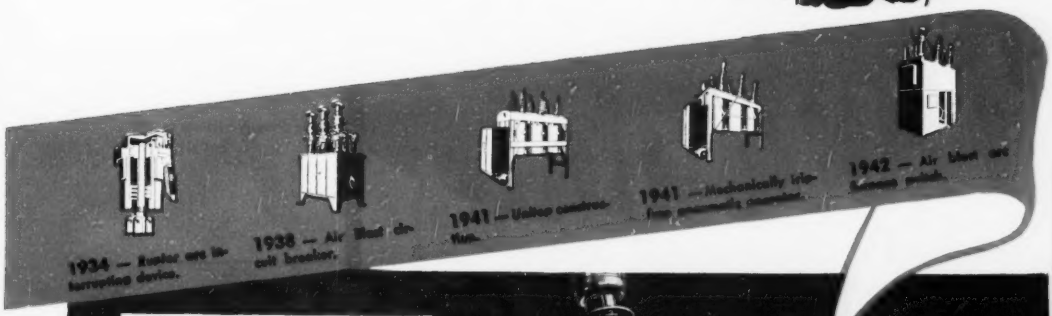
Pioneers in Power and Electrical Equipment from Generation through Utilization

Fine Breakers


1934 — Rotor arc interrupting device.
1938 — Air blast circuit breaker.
1941 — Unitor control.
1941 — Mechanically trip-free pneumatic operator.
1942 — Air blast arc

1947 1948 1949

Supervoltage power circuit breakers with 3 or 5 cycle interruption, 161 and 230 kv, interrupting capacities up to 7,500,000 kva.

Cole Electric Co.

8439 Steller Drive — Culver City, Calif.

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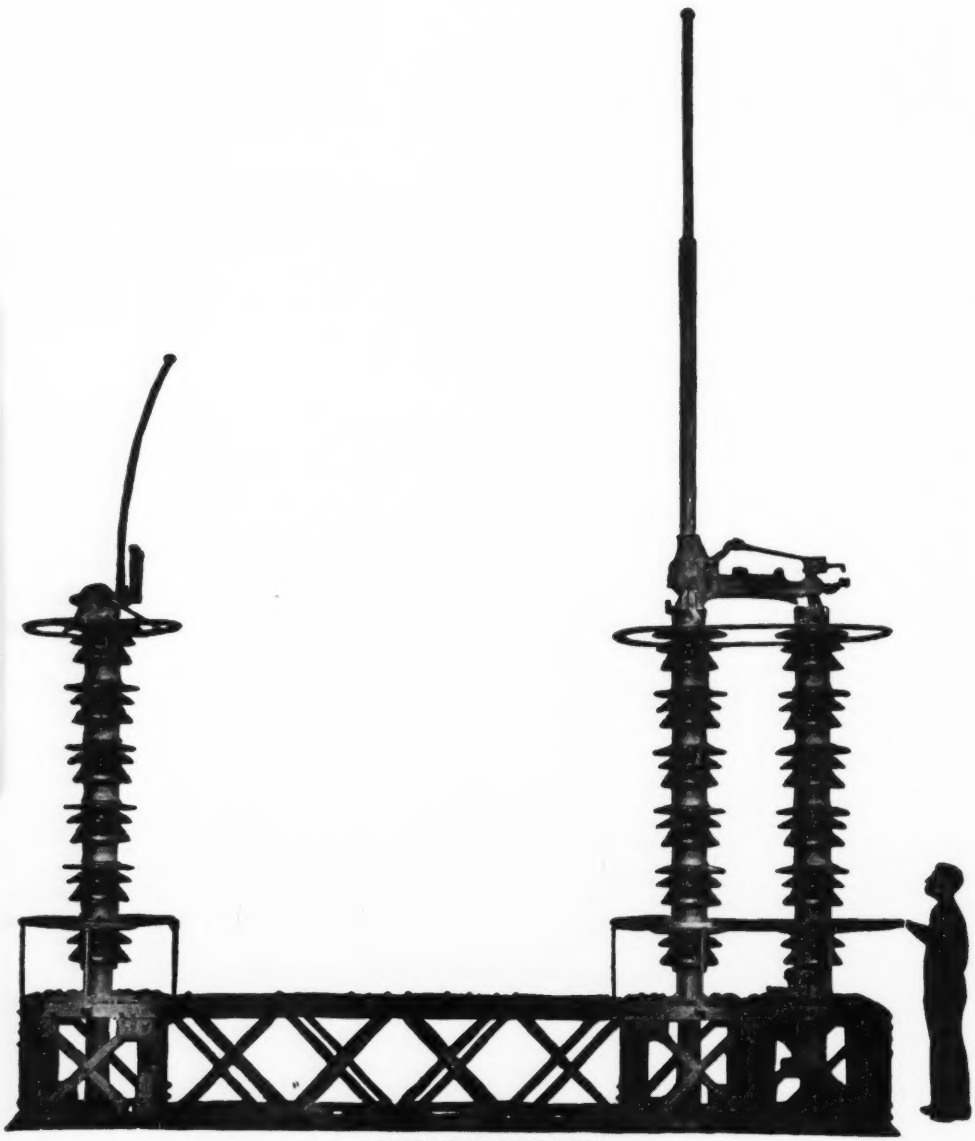
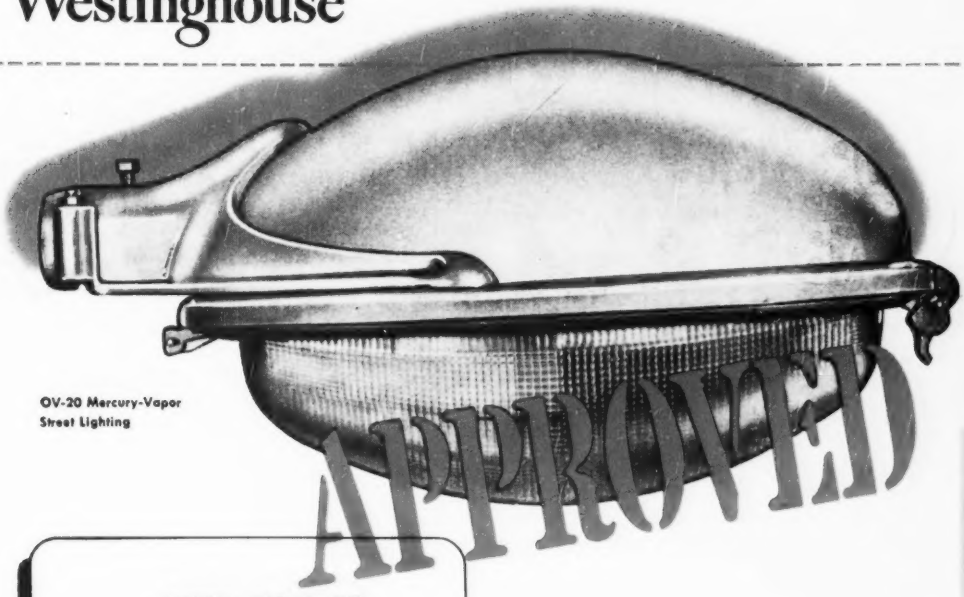


AIRBREAK DISCONNECTING SWITCH

230,000 Volts—1200 Amperes, Type OU, T.P.S.T. Vertical Break, Group Operated. (One Pole Shown)
See Bulletin 45A

YOU CAN BE **SURE**.. IF IT'S

Westinghouse



OV-20 Mercury-Vapor Street Lighting

AND FOR 10 GOOD REASONS:

1. OV-20 was the first luminaire designed specifically for Mercury-Vapor lamps.
2. OV-20 is the first luminaire operating the mercury lamp horizontally—without the use of magnets.
3. OV-20 was the first new postwar street lighting development.
4. OV-20 provides modern design—streamlined appearance.
5. OV-20 provides highest roadway brightness—with minimum glare.
6. OV-20 has hinged glassware holder for easy maintenance.
7. OV-20 glassware is easily changed in the field—without tools.
8. OV-20 provides either Type II or III I.E.S.-A.S.A. light distribution patterns.
9. Type can be changed in the field by simply changing the glassware.
10. No other mercury unit provides these features.

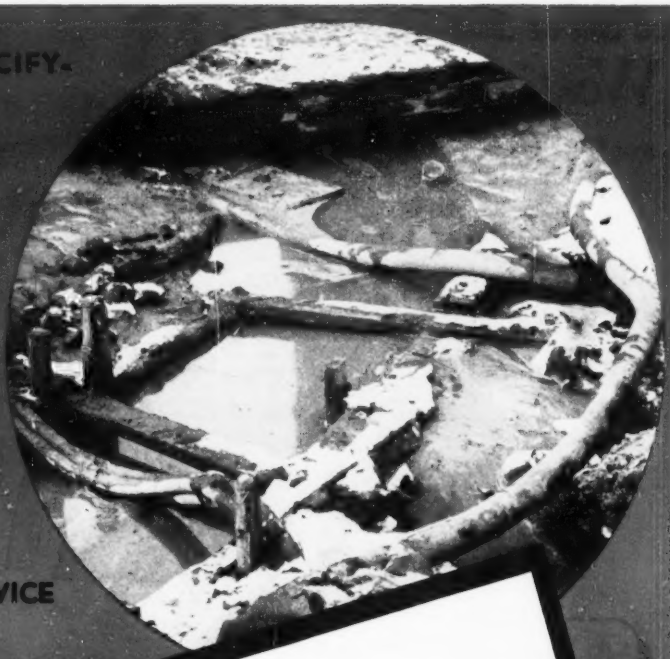
Thousands installed Across the Nation!

These are but a few of the reasons Westinghouse OV-20 has gained coast-to-coast approval in just three years. Get the complete story in B-3970 from Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Penna. J-04240

Westinghouse
PLANNED LIGHTING PAYS

WHEN YOU SPECIFY-

TIREX PORTABLE CABLES



YOU CAN BE SURE OF LONG, DEPENDABLE SERVICE

HERE'S WHY

THEY'RE FLEXIBLE

Proper choice of the small copper wires, and their proper assembly, provides outstanding flexibility. Simplex-TIREX Cables never kink or snarl.

THEY'RE ELECTRICALLY SOUND

Careful compounding of the insulation over conductors assures stable electrical properties and also, mechanical strength to withstand rough usage.

THEY'RE MECHANICALLY TOUGH

TIREX Cables are protected by an inner jacket, two seine twine serves, and an outer jacket of Selenium Neoprene.

By the "CURED-IN-LEAD" process, all are fused together to form a single reinforced jacket that is unsurpassed for toughness and long life. It effectively cushions the conductors and protects them against crushing and mechanical shock. It is tops for protection against abrasion, oil, grease, weather hazards, sunlight, heat and flame.

For complete details on all TIREX Cables write for catalog 994.

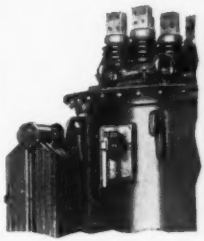
Simplex-Tirex

SIMPLEX WIRE & CABLE CO., 79 SIDNEY ST., CAMBRIDGE 39, MASS.

Get these Extra-Quality Features..

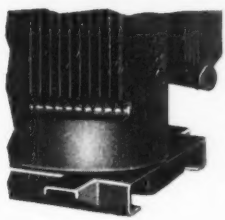
STRONG, PROTECTED RADIATORS

Radiator fins are grooved for added rigidity... bonderized for added protection against rust. Staggered fin construction simplifies repainting.



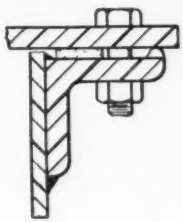
SIDE OPERATED TAP CHANGER

Easily accessible and readily observed no-load tap changer operating handle is located on side of transformer tank. Operating mechanism is simple, clean cut in design.



RIGIDLY BRACED BASE

Modern fabricated base permits rolling in all directions. Convenient jacking pockets are designed for use with all standard lifting devices. Provisions in base facilitate grounding.



CONTROLLED GASKET COMPRESSION

Gas and oil leakage is eliminated at every gasketed joint. Controlled gasket compression insures oil-tight seal... prevents injury to gasket through over-compression.

. . IN YOUR NEXT SUBSTATION TRANSFORMER!

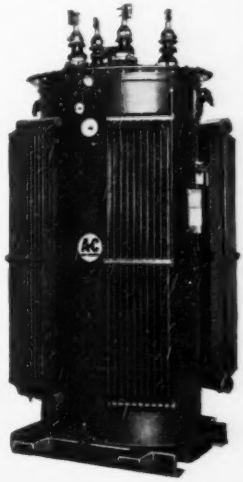
LOOK AGAIN AT the features above! They add up to easier installation . . . less maintenance . . . lower cost operation! They're *extra-quality* features found in *all ratings* of Allis-Chalmers power transformers.

ALSO IMPORTANT ARE . . .

a number of "unseen" quality improvements recently made possible through new and improved methods of construction. They include closer control of electrical core steel characteristics and extended use of bonderized surface protection—added steps toward bringing you the *best* in power transformer performance.

Want more information on Allis-Chalmers bonus-built transformers? Call your nearby A-C sales representative today. Or write direct. A 2752

ALLIS-CHALMERS, 932A SO. 70 ST.
MILWAUKEE, WIS.



ALLIS-CHALMERS

Final Check-up of Economy 42-inch Vertical Axial Flow Pump Courtesy of Economy Pumps, Inc.

A LITTLE STROBOTAC HELPS TO TEST A BIG PUMP

Accurate testing under actual working conditions is a must in the Testing Laboratory of Economy Pump, Inc. of Hamilton, Ohio. Their axial flow pumps are especially designed and custom-built for drainage, irrigation, condenser circulating and other services which require the pumping of large volumes of water.

Economy Pumps, Inc. writes us as follows:

"We use the Strobotac to check speed of vertical axial flow pumps because the ends of the shafts are usually inaccessible. One end is below the floor, under water. The other is at the top of the motor, perhaps ten feet above the floor. Some shaft is exposed to view near the floor and we illuminate that with the Strobotac." (See photograph)

"We also use the Strobotac for dynamic balancing of large impellers for our pumps."

Here, as in hundreds of instances, the Strobotac accurately measures the speed of moving parts inaccessible to other methods. By "stopping motion", the Strobotac flash (5 to 10 microseconds) reveals conditions and causes, effects and defects, previously hidden or obscured.

STROBOTAC

Type 631-B

Flashing Speed Range: from 600 to 14,400 per minute, calibrated to read directly in rpm. Upper speed limit: 100,000 rpm.

Flash Durations: between 5 and 10 microseconds.

Power Supply: 115 volts, 60 cycles.

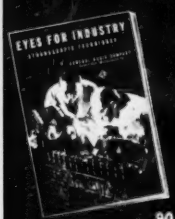
Power Input: 25 watts

Tubes: complete set furnished, also cord and plug.

Dimensions: 7½ x 8¼ x 9⅞ inches.

Price: $125.00

Write for your 24 page manual of stroboscopic techniques, "Eyes for Industry".



GENERAL RADIO COMPANY

Cambridge 39, Massachusetts

90 West St., New York 6 920 S. Michigan Ave., Chicago 5 1000 N. Seward St., Los Angeles 38

Better... Lighter Weight... Smaller... More Efficient... Less Costly to Store... Easier to Install

4 NEW PENNSYLVANIA POLE STAR TRANSFORMERS

37½ · 50 · 75 · 100 KVA

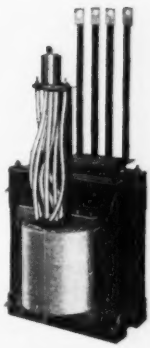
The new 100 KVA POLE STAR TRANSFORMER

is **35%** *lighter*

requires **36½%** *less oil*

covers **35½%** *less floor area*

than the 100 KVA Stacked Core Transformer it replaces



Interior assembly of 75 Kva POLE STAR. Core can be taken apart and rebuilt without changing the core loss or exciting current.

Now a COMPLETE LINE OF POLE STARS from 3 KVA through 100 KVA

The four transformers now added to the POLE STAR line are fundamentally the same as the original POLE STARS. Cores are wound of cold rolled steel. Core laminations are individually lapped for low exciting current and ease of disassembling and rebuilding the core and coil unit. On 2400 and 4800 volt units straight, side-issuing, high voltage bushings, with insulating caps, replace pockets and pocket bushings. Transformers are of Sealed Tank construction. Synthetic rubber gaskets are used throughout.

In other words: The POLE STAR is a better transformer than the stacked core transformer it replaces. It operates with greater efficiency and at less cost. It is lighter in weight, smaller in dimensions, cheaper to store and easier to install.

***Pennsylvania* TRANSFORMER COMPANY**

PITTSBURGH 12, PENNSYLVANIA

Write for Catalog No. 1049

P.S. LET THE POLE STAR BE YOUR GUIDE ... Product Of Long Experience—Safe Thrifty And Reliable

CUT POLE-TOP SWITCH COSTS!

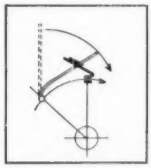
DEAD-END CONDUCTORS *DIRECT* TO NEW KPF TYPE "A" SWITCHES!

NEW QUICK-BREAK ATTACHMENT FOR KPF SWITCHES

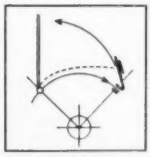
THE SPLIT-SECOND BREAKING SPEED of this new KPF Quick-Break Attachment means you can now switch many high-voltage circuits without employing expensive circuit breakers.

This new attachment is already in use opening 60 kv loops with loads up to 12,000 kva; in switching 1080 kva, 11 kv capacitor banks; and in other applications including the dropping of 32 miles of 69 kv line.

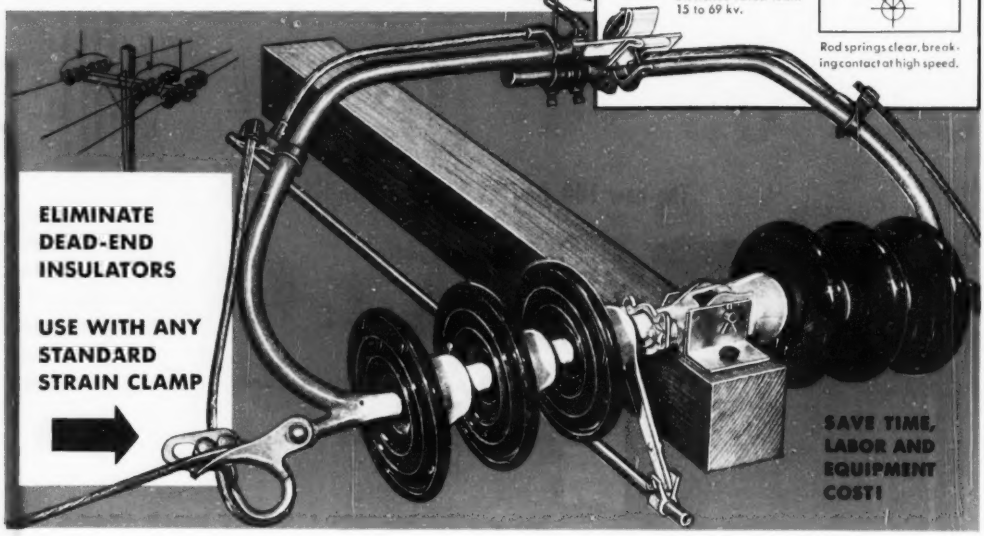
The KPF Quick-Break Attachment fills the gap between simple disconnects and expensive circuit breakers. It is available for all KPF switches rated from 15 to 69 kv.



Spring rod winds to full tension as switch opens.



Rod springs clear, breaking contact at high speed.



DEAD-END LINES HOT to these new KPF Type "A" Pole Top Switches—and save! Eliminate dead-end insulators; use any type of standard strain clamp!

KPF Type "A" Switches are simple in design, ruggedly constructed, and easy to install. They consist of two insulator stacks with a bearing assembly that permits stacks to be adjusted to normal line sag. Patented, free-floating, self-aligning contacts maintain proper contacts under any conditions of switch sag adjustment. Switch arms and dead-end eye are integral with the insulator assembly. The forged dead-end eye is of standard dimensions, so it will accommodate standard strain clamps. This makes for faster, more convenient hot line installation. The interphase control is of the push-pull type, which means that switch operation is unaffected by cross-arm warpage—even after long periods of idleness.

KPF air-break switches have been proven in thousands of applications during the past 40 years.

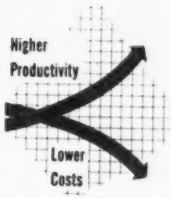
FIND OUT HOW KPF TYPE "A" SWITCHES CAN SAVE FOR YOU! WRITE TODAY FOR DETAILS!

K·P·F ELECTRIC COMPANY · 855 Howard Street · San Francisco 3, Calif.

Electrical World's

"Cost-Cutters"

are coming Oct. 22



30 pages will carry 150 or more short items. Widely diversified, terse, sharp, factual: each *tells*, in plain words, a method that saves money in a construction, operating, maintenance or administrative job. Each item *shows* by picture, diagram or chart, how to cut costs.

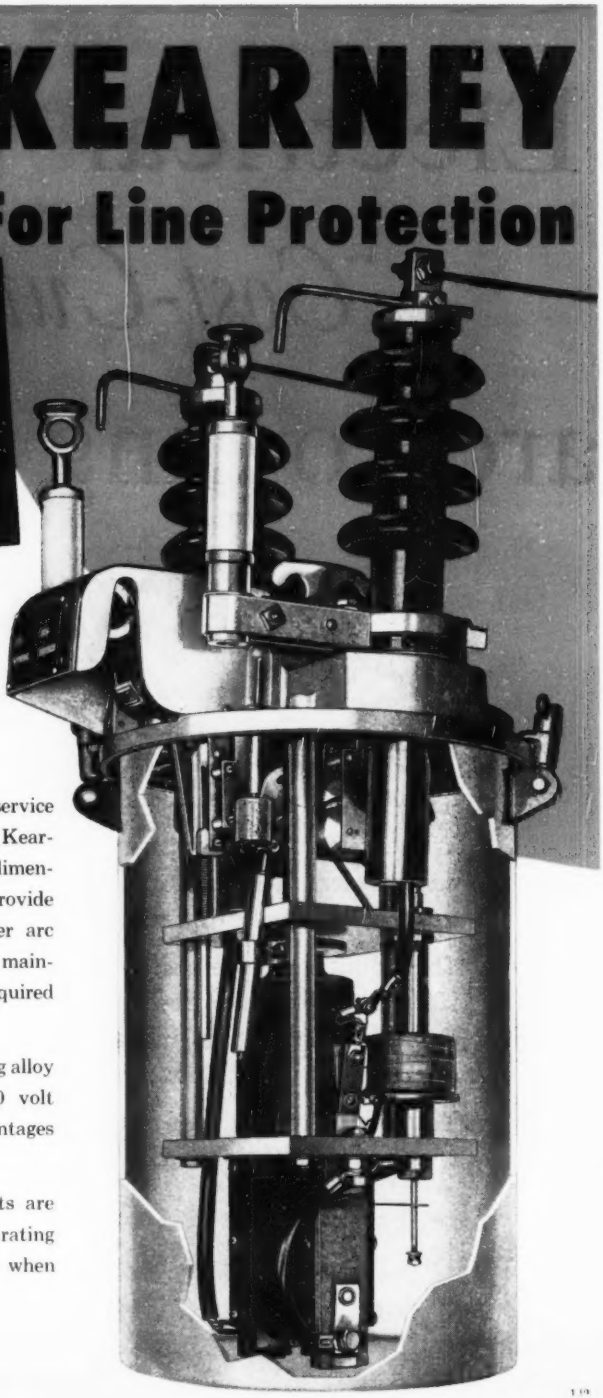
We've assigned 200 topics to the editorial staff—topics ranging from "Special tools to help reassemble valves quickly" to "Use of punch card for billing operations."

The editors will weigh, measure, study and sift these 200 topics in plants throughout the country, to get the sharpest cost cutters in use today, in every industry department, from Coast to Coast.

You'll want to read and re-read this story . . . the date, remember, is October 22.

Two New KEARNEY For Line Protection

THE AUTOMATIC OIL CIRCUIT RECLOSER



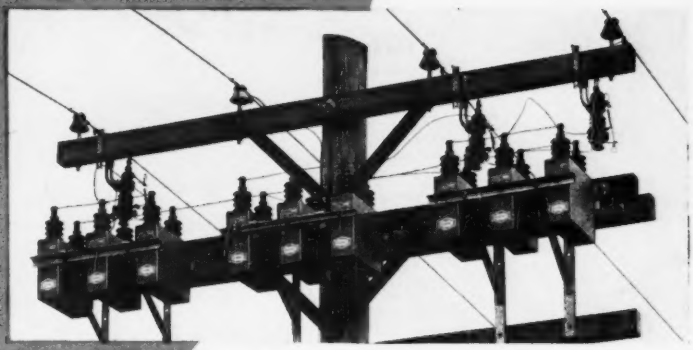
With New Time Current Characteristics to Permit Replacement of Any OCR on Your Line

Now you can grade up your service for increased loads by using the Kearney OCR with larger physical dimensions. These larger dimensions provide greater oil capacity and greater arc quenching ability which reduce maintenance trips. Oil changes are required at less frequent intervals.

Built with two heavy arc-resisting alloy contacts and full rated 15,000 volt bushing, this unit provides advantages not found in smaller OCR's.

Operating characteristics charts are available—be sure to specify the rating in which you are interested when making your request.

PRODUCTS
and Power Conservation



Hand-holds in the carton are a practical convenience for storekeepers or linemen.

The SHUNT CAPACITOR for Power Factor Correction

With Over 15 Years of Capacitor Building Experience "Built In," Specify Kearney and Get These Advantages...

1. Fit all standard mounting racks
2. Extra heavy wet process porcelain bushing
3. Welded sheet steel case with hot zinc spray and enamel coating provides double protection to reduce maintenance cost, and
4. Exclusive Kearney protective packaging feature

The greatest single factor in causing faulty operation of a capacitor is its liability to loss of vacuum through misuse or damage to the bushing through careless handling. That's why Kearney developed a method of packing capacitors in a combination wood frame and corrugated box that protects the capacitor from the moment it leaves the production line until it is safely installed on the crossarm.

Write for bulletin 21-1 for complete information.

Capacitors are raised by a hand line through a welded lifting ring, with the wood frame intact.

JAMES R. KEARNEY CORPORATION

4224-42 Clayton Avenue, Saint Louis 10, Missouri — *Canadian Plant: Guelph, Ontario*

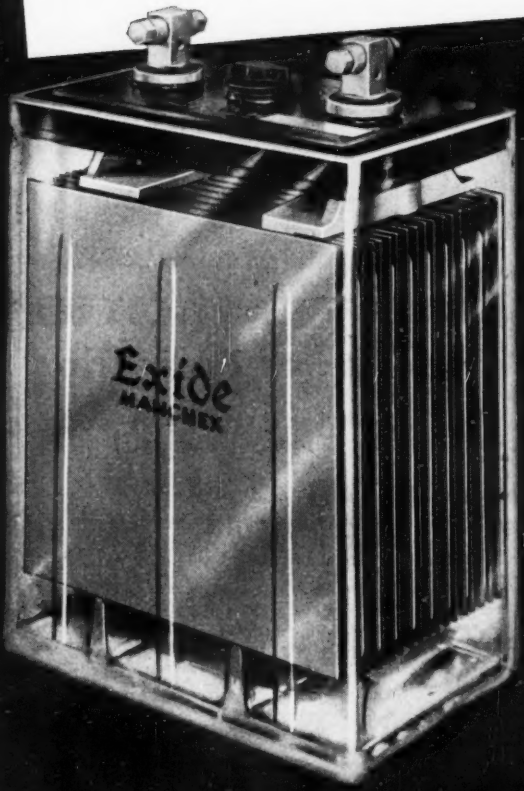
Always Specify JAMES R. KEARNEY CORPORATION ST. LOUIS, MO. *for the Job...*

Better Construction – *SAFER* Maintenance

THE NEW EXIDE-MANCHEX BATTERY

POWER . . . PERFORMANCE . . . ECONOMY

for Central Station Service



Exide
BATTERIES

An important feature of the new Exide-Manchex Battery is the famous manchester positive plate with its unique lead button construction. The buttons, rolled strips of corrugated lead, are pressed into holes of the lead-antimony grid. Forming action expands the buttons and locks them securely in place. Only a comparatively small portion of the total lead is formed initially into active material . . . the remainder is available for gradual conversion in service.

Negative plates, separators and other elements are designed to match the long life and efficiency of the positive plates. All combine to provide a battery of exceptional power and long-lasting, trouble-free performance.

Use Exide-Manchex Batteries for switchgear and control bus operation, emergency light and power, and other storage battery services. It will provide up to 100% more capacity in the same given space.

1888

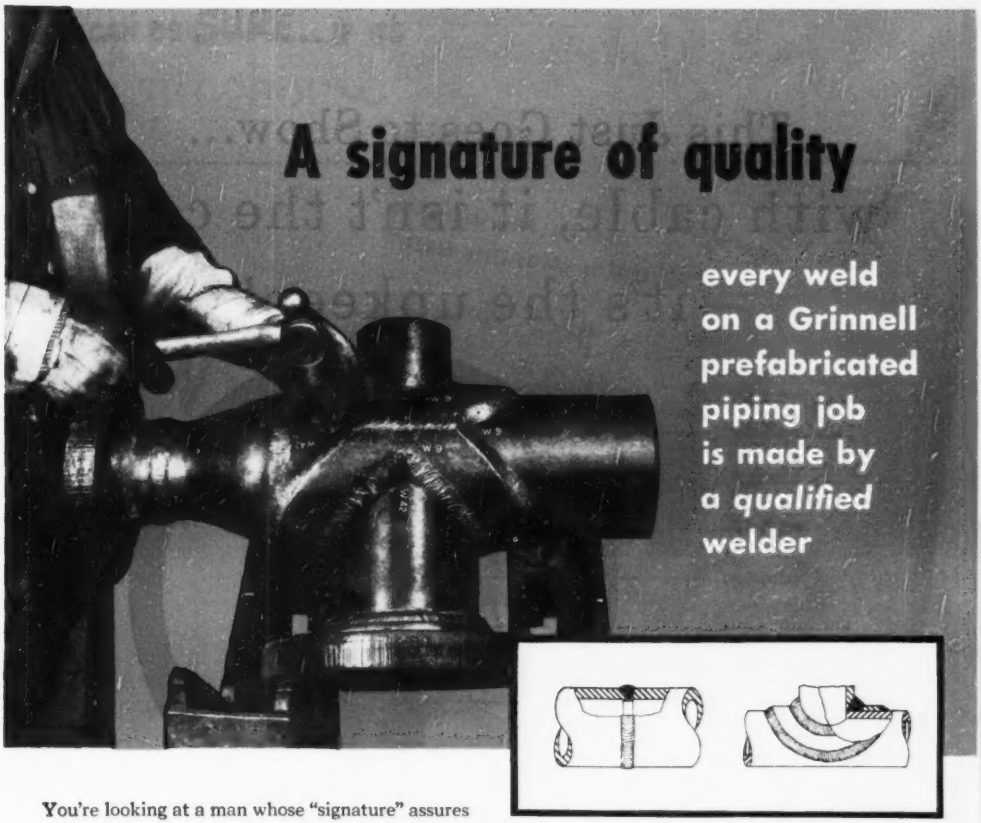
DEPENDABLE BATTERIES FOR 61 YEARS

1949

THE ELECTRIC STORAGE BATTERY COMPANY
Philadelphia 32

Exide Batteries of Canada, Limited, Toronto

"Exide" *Reg. Trade-mark U. S. Pat. Off.*



You're looking at a man whose "signature" assures quality welding of piping. He's a Grinnell welder and, as every Grinnell welder, he is qualified by Grinnell according to a procedure which conforms to A.S.M.E. Boiler Construction Code, Section 9. After qualifying, he is given a number which he "signs" adjacent to each weld he makes.

Quality welding is only one of a long chain of responsibilities assumed by Grinnell on every prefabricated piping job . . . from the interpretive engineering to the on-time delivery of the fabricated piping. Such responsibility requires facilities for metallurgical research and testing, comprehensive knowledge of state laws and industry codes, and a complete familiarity with insurance company requirements for fabricated piping.

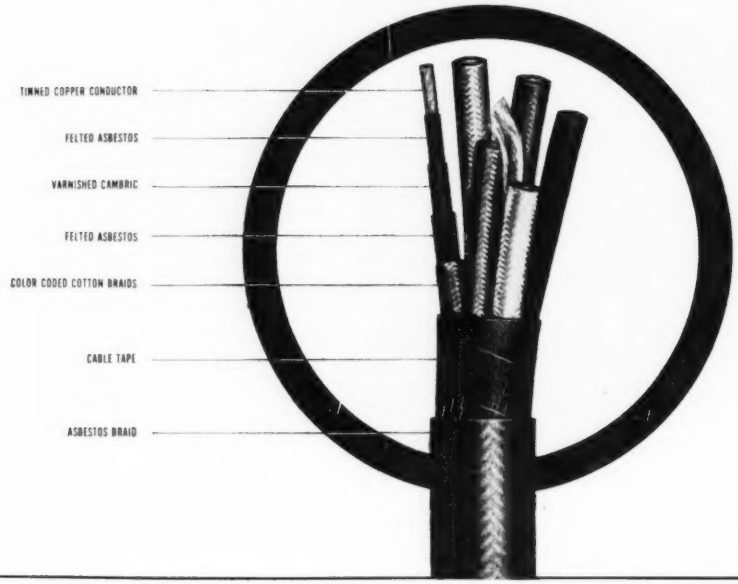
The fabrication of piping for today's high pressure, high temperature or corrosive services is a job for experts. It's a job for Grinnell prefabricating plants because Grinnell has the modern equipment and methods, and the skilled personnel which enable them to assume total responsibility for the job.

99 YEARS PIPING

GRINNELL

Grinnell Company, Inc., Providence, Rhode Island. Branches: Atlanta • Buffalo • Charlotte • Chicago • Cleveland • Cranston • Fresno • Kansas City • Houston Long Beach • Los Angeles • Milwaukee • Minneapolis • New York • Oakland • Philadelphia • Sacramento • St. Louis • St. Paul • San Francisco • Seattle • Spokane

This Just Goes to Show...
with cable, it isn't the cost
—it's the upkeep!



An Eastern Electric Utility used single conductor ROCKBESTOS AVC Wires and Cables for years.

But for "economy" they had been using ordinary low temperature control cable in their generating stations on vital control circuits to main steam boilers — burner tilt mechanisms and main power valves.

These circuits are close to steam lines — where it's hot! *Ordinary* control cables didn't stand up.

Convinced that ROCKBESTOS AVC . . . *Asbestos-Varnished-Cambric* . . . Permanent Insulation pays for itself in longer life, less maintenance and fewer outages, the Company has now replaced the ordinary control cable in this hot spot with ROCKBESTOS Table MD AVC Control Cable.

It will pay *YOU* to know the ROCKBESTOS story! Write.

ROCKBESTOS PRODUCTS CORPORATION
NEW HAVEN 4, CONN.

NEW YORK CLEVELAND DETROIT CHICAGO
PITTSBURGH ST. LOUIS LOS ANGELES OAKLAND, CAL.

WIRES and CABLES by

ROCKBESTOS

. . . . dare to be better

YOU CAN BE **SURE**.. IF IT'S

Westinghouse

New Booklet

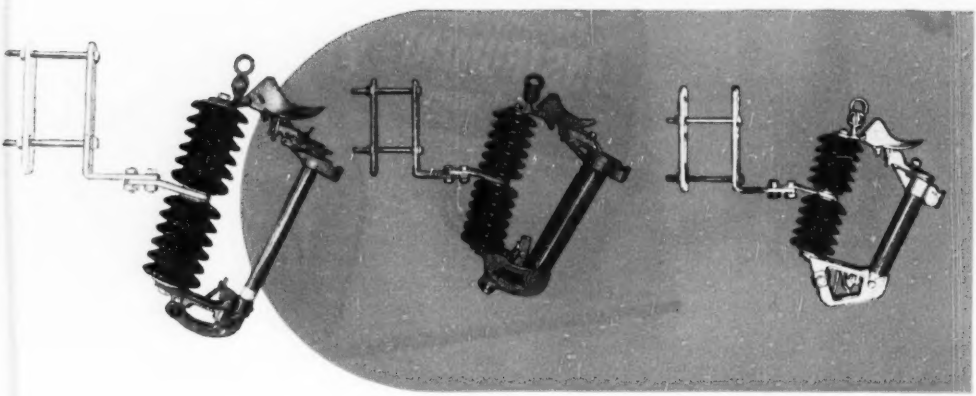
The complete line of Westinghouse Instrument Transformers—*the most complete line in the industry*—fully described and illustrated. Classified pictorial index makes it easy to select the transformers best suited to your needs. Get your copy from your Westinghouse representative, or write for Booklet B-4319, Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70543

Westinghouse
INSTRUMENT TRANSFORMERS

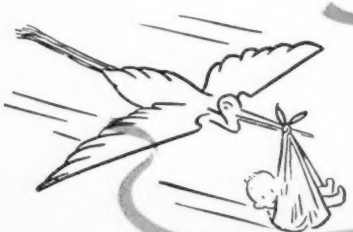
ON DUTY

Here are the watchdogs of power, dependable and quick to act when trouble strikes! Southern States dropout cutouts and power fuses are on duty 24 hours a day. These absolutely dependable fuses protect equipment and systems against power faults. On lines and substations they have shown their positive, accurate operation under the most adverse conditions.

The Most Complete Line of



	Standard Duty TYE 33 DROPOUT CUTOUT	Heavy Duty TYPE HH33 DROPOUT CUTOUT	Medium Heavy Duty TYPE H33C DROPOUT CUTOUT
Voltage Ratings	5 kv through 15 kv	5 kv through 15 kv	5 kv through 15 kv
Continuous Current in Amperes	50-100-200	50-100-200-300	50-100-200
Maximum Interrupting Ratings in RMS Amps.	1,200 through 4,000	9,000 through 28,000	6,000 through 14,000



COMING SOON: . . .

The Type PE-33 . . . a porcelain enclosed distribution cutout . . . worthy companion to the Type 33 . . . and another in a line of dependable products. To be announced in the near future.

DAY AND NIGHT...

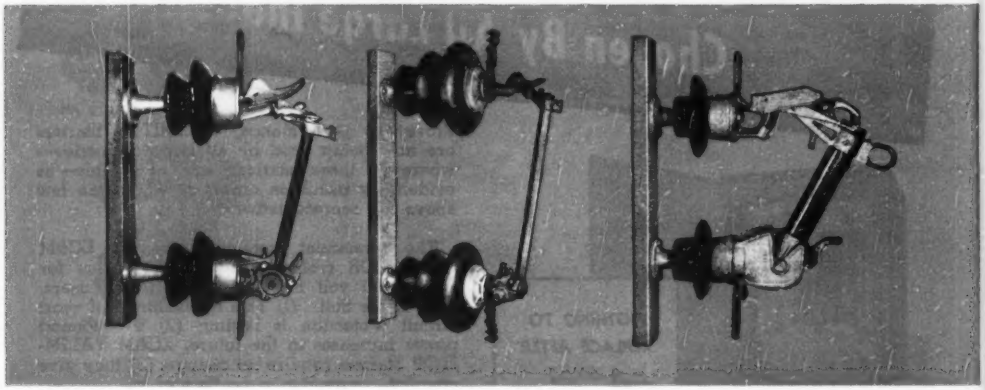
Construction features which make SS fuses and cutouts so dependable:

- Solid copper contacts with constant, even pressure.
- Knee-action members for positive dropout action.
- Double venting for greater fault capacity — and for reduced mechanical shock.
- Visual indication of operation by hanging position of cartridge when fuse is blown.
- Simplicity of design.

Southern States cutouts have a universal mounting bracket, permitting either pole or cross-arm mounting. The two-piece insulator unit reduces replacement cost.

SS Dropout Fuses featuring the snubber have a friction brake action which brings the cartridge to a smooth, cushioned stop at the end of the opening swing and prevents mechanical shock.

Expulsion Fuses Available to the Industry!



Standard Duty TYPE MF-1 DROPOUT FUSE	Medium Heavy Duty TYPE MH-2 DROPOUT FUSE	Heavy Duty TYPE HMH-1 DROPOUT FUSE
7.5 kv through 69 kv	7.5 kv through 69 kv	7.5 kv through 161 kv
50-100-200	50-100-200	50-100-200-300-400
1,000 through 4,000	2,000 through 11,500	3,500 through 30,000

Southern States SS Equipment Corp.

HAMPTON GEORGIA

Representatives in:

BIRMINGHAM, ALA.
LOS ANGELES, CALIF.
SAN FRANCISCO, CALIF.
DENVER, COLO.
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HOUSTON, TEX.
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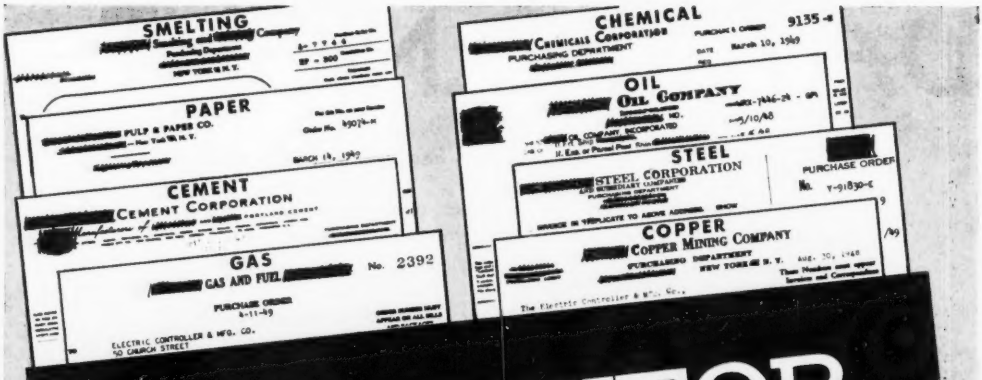
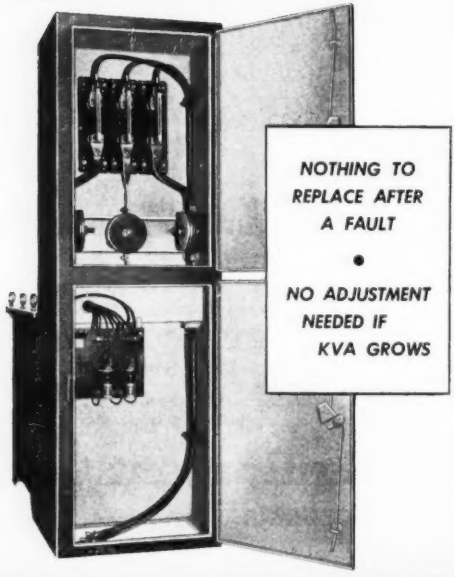
SALT LAKE CITY, UTAH
SEATTLE, WASH.
MILWAUKEE, WISC.



VALIMITOR

2300-4600 Volt Motor Starters Chosen By All Large Industries



NOTHING TO REPLACE AFTER A FAULT

•

NO ADJUSTMENT NEEDED IF KVA GROWS

Proven by performance, VALIMITOR Starters are now being used by all large industries—wherever these starters are applicable—as evident by purchase orders of which the few above are representative.

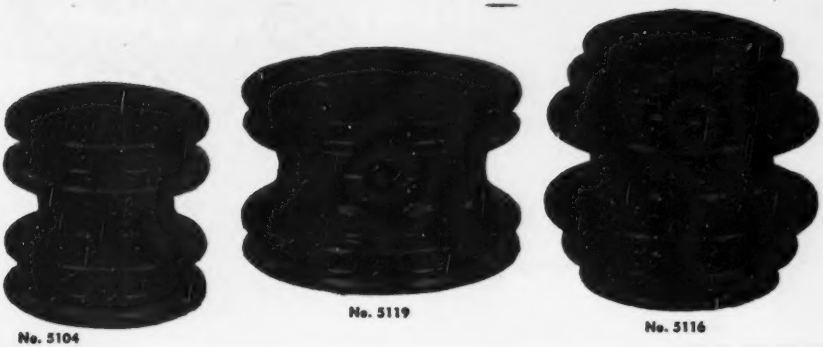
The permanent protection given by EC&M VALIMITOR (volt-ampere-limitor) Starters for 2300-4600 volt motors appeals to all users. They know that: (1) This new method of short circuit protection is lasting; (2) if incoming power increases in the future, EC&M VALIMITOR Starters require no change; (3) they give complete protection regardless of the capacity of the bus to which they are connected . . . *the KVA may be infinite.*

When a short occurs, maximum fault current is limited to 25,000 KVA (steady state current) or less. The EC&M Type ZHS, magnetic, heavy-duty Contactor clears the circuit quickly. There's nothing to replace—no spares to stock—no time out for replacement. To restart—just press the start button.

No. 23 ACCELERATOR Bulletin describes VALIMITOR Starters and their applications. Write for your copy.

THE ELECTRIC CONTROLLER & MFG. CO.

2698 EAST 79TH STREET ★ CLEVELAND 4, OHIO



No. 5104 No. 5119 No. 5116

No. 5101

No. 5112

It Costs No More for the Top Quality Brand...

PORCELAIN PRODUCTS' WET PROCESS SPOOLS

Talk quality. Talk price. Talk features. No question about it. Porcelain Products' wet process spools are the top quality brand at competitive prices. Ask people who use them. Better still, you be the sole judge of their performance. Tomorrow, change that name line on your purchase order to "Porcelain Products". Give this "top quality" claim of ours a test—at no extra premium either.

If you have a special design problem, ...consult us!
If you've never used Porcelain Products' Spools and would like samples, just check off the ones you'd like, fill in the coupon and return to us. If you're an old customer and lack any samples to fill out your line, please fill in the coupon and return it, too.

Gentleman:—Please send me without obligation samples and prices of the following spools.

☐ 5101 ☐ 5104 ☐ 5112 ☐ 5116 ☐ 5119

Name_____

Company Name_____

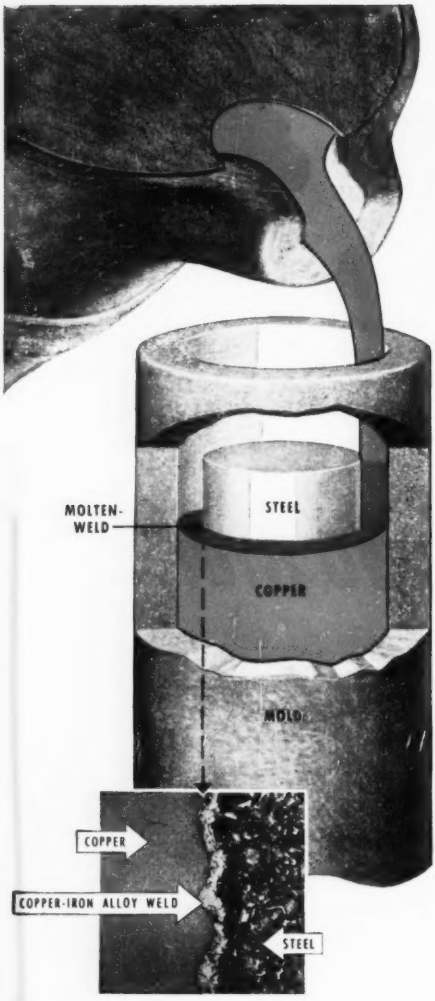
St. Address_____

City_____ State_____

Porcelain Products, Inc.

PARKERSBURG, WEST VIRGINIA

ONE OF THE LARGEST PRODUCERS OF SPOOLS



This photomicrograph of the Molten-Weld shows how the grains of copper and steel interlock to form a permanent, continuous weld. No other process achieves this inseparable union.

EVERY Copperweld GROUND ROD IS MOLTEN-WELDED —NOT COPPER-PLATED

WHAT'S THE ADVANTAGE?

By this unique Molten-Welding process—used only by Copperweld Steel Company—a uniformly thick sheath of pure copper is inseparably welded to an alloy steel core. Under carefully controlled conditions, the grains of both metals interlock to form a permanent, continuous weld. And from the moment of this union, Copperweld* performs as one metal. Hot rolling, cold drawing, pounding, or temperature changes cannot destroy the Molten-Weld in Copperweld Ground Rods.

WHAT DOES THE MOLTEN-WELD IN COPPERWELD MEAN TO YOU?

In service, this permanent Molten-Weld completely eliminates the possibility of harmful electro-galvanic action in the presence of moisture. There are no microscopic cracks, fissures, or pin holes in the thick copper exterior to admit moisture and give destructive rust a foothold.

So, for permanent grounding protection at lowest annual cost, insist upon Copperweld Ground Rods and get the rust resistance and conductance of copper plus the strength and easy-driving qualities of alloy steel. The time-tested dependability and economy of Copperweld products have been proved in service for 35 years.

**Trade Mark*

Made By

COPPERWELD STEEL COMPANY, Glassport, Pa.

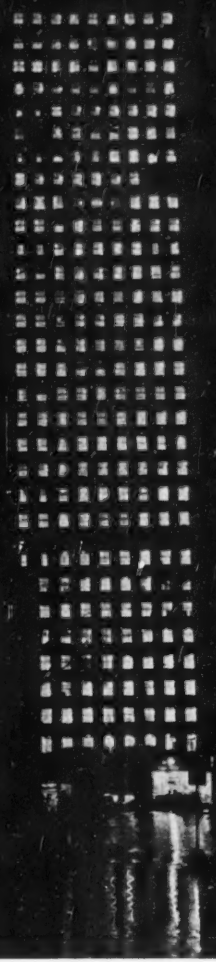
THEY'RE MOLTEN-WELDED Copperweld GROUND RODS -NOT COPPER-PLATED

Stocked And Sold By:

HUBBARD AND COMPANY • JOSLYN MFG. & SUPPLY CO.

And All Their Distributors

WHY A WELL PLANNED LIGHTING INSTALLATION NEEDS CORNING ALBA-LITE



Well planned fluorescent lighting results not only from the design and location of fixtures but also from the proper use of lighting glassware. Corning ALBA-LITE deserves special recognition for its qualities of diffusion and brightness control.

It diffusely transmits 60 to 65% of the light and diffusely reflects 25 to 35%, making its efficiency greater than 90% (the sum of reflection and transmission). This combined with even transmission and low panel brightness makes it adaptable to almost any type of fluorescent installation.

All these qualities are contained in a thin glass panel which permits shallow fixture construction, whether in fixtures or in complete ceilings. Cleaned easily, ALBA-LITE does not retain finger prints and resists weathering. It will not warp, discolor or scratch, regardless of the length of time in use. Add this to sound lighting qualities and you get efficient lighting performance.

Bulletin LS-17, now available, describes how ALBA-LITE is used for direct, semi-direct, semi-indirect lighting and completely luminous ceilings. It also covers Corning's complete line of Engineered Lightingware. You should have a copy if lighting is one of your responsibilities.

ALBA-LITE is used on almost every floor of the Esso Building, New York City; Architects: Carson & Lundin; Lighting Engineers: Pollak & Grieve; Fixture Manufacturer: Caldwell & Co., all of New York City.

CORNING Means research in GLASS

PYREX T.M. REG. U.S. PAT. OFF.

CORNING GLASS WORKS, DEPT. EW-9, CORNING, N. Y.

Please send me your Data Book LS-17, "Corning Engineered Lightingware," describing MONA-LITE, ALBA-LITE and other Corning products.

NAME_____ TITLE_____

COMPANY_____

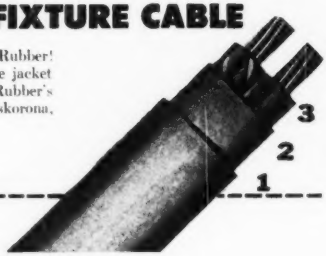
ADDRESS_____

CITY_____ ZONE____ STATE_____

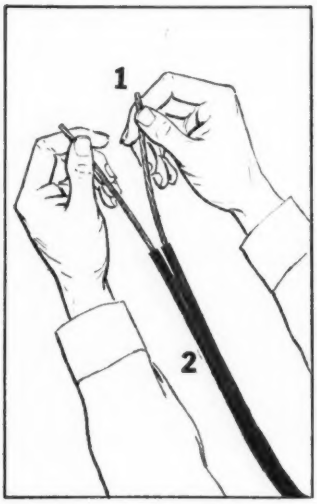
2 Great New "Rough Weather" Cables for Modern Street Lighting

❶ STREET LIGHTING POLE AND FIXTURE CABLE

Here at last is a truly weatherproof cable—and it's made by U. S. Rubber! No festooning, no unravelling or loose ends—thanks to the Neoprene jacket (1) which eliminates fibrous cover. The belt (2) is made of U. S. Rubber's famous Uskorona for extra protection. The insulation (3) is also Uskorona, which is highly resistant to ozone, moisture, heat and cold.

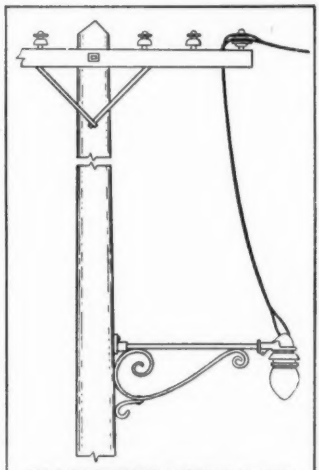


❷ MULTIPLE CIRCUIT "ZIP-CORD" CABLE



Unique construction allows quick separation of conductors by "zipping" the cord.

The Zip-Cord construction (1) makes installations and connections simple and quick on open drops, on series circuits, multiple circuits or secondaries of I.L.'s. Here again this cable will not festoon. The smooth Neoprene cover(2) is specially compounded for rough weather duty. Neoprene makes the wire lighter, smaller in diameter than the ordinary braid construction. The Neoprene cover lasts almost indefinitely even in areas where the weather cycles are extremely severe.



BRACKET TYPE INSTALLATION

For more information write Electrical Wire and Cable Department, United States Rubber Company, Rockefeller Center, New York 20, N. Y.

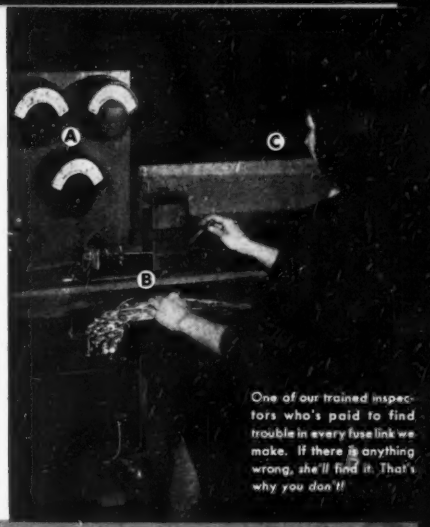
MADE BY

U.S.RUBBER
SERVING THROUGH SCIENCE

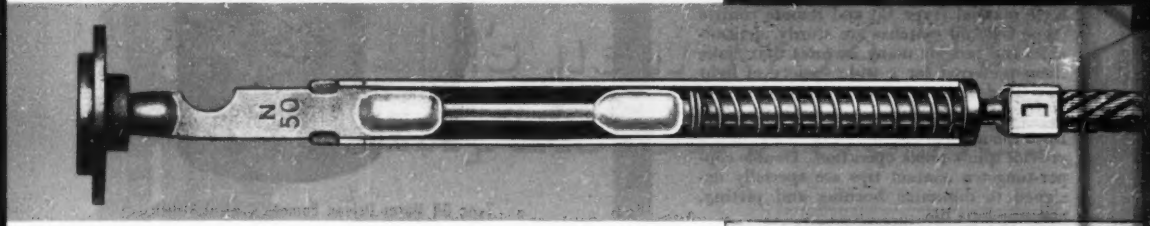
UNITED STATES RUBBER COMPANY

She bets we'll be wrong... in either case, YOU WIN!

Every L-M UNIFIT FUSE LINK is individually tested



One of our trained inspectors who's paid to find trouble in every fuse link we make. If there is anything wrong, *she'll* find it. That's why *you don't!*



One bad apple may spoil the barrel. One bad fuse link could make a lot of trouble for our customers. So, to assure complete reliability, we test every individual L-M fuse link. Not one in a thousand, not spot checking, but *every one*, gets the "works." Tested for accuracy! Tested for coordination! Tested for strength, and mechanical construction!

We think L-M is the only fuse link manufacturer giving 100% inspection. It takes more work—sure—but that's why L-M links have such an enviable reputation for accuracy—especially among men to whom precise coordination is important. For details on L-M's very complete line of fuse links, ask the L-M Field Engineer or write *Line Material Co., Milwaukee 1, Wisconsin.*

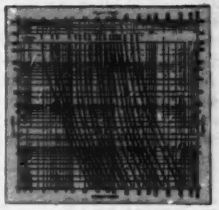
Fuse Coordination your problem?

In addition to making our fuse links so they will coordinate, we have developed a fairly complete manual on Fuse Coordination. Men who have used it have been very complimentary about it. If *you* have a fuse coordination problem and would like a copy, drop us a note.

*Only L-M can give you a link like the one shown above! This is a 50-amp spring type link in die-cast construction, an L-M exclusive process!

Here's what our inspectors check:

(A) Accuracy of Rating for Precise Coordination:
Every link must coincide closely with the melting and clearing time curves. Millivolt tests show whether the link is accurate. If not, out it goes—to the scrap pile, *not* to the customer. That's why you can depend on L-M links for coordination.



(B) Pull Test:
NEMA specifies a 10 pound test so that links won't pull apart needlessly under cutout tension. Ours pass that test with a good margin of safety—or you never get them!

(C) Physical inspection:
To weed out any other possible faults. Every L-M link gets a pretty critical once-over—it's gotta be good!

LINE MATERIAL Fuse Links

Complete Coordinated Equipment for All Distribution Requirements

KYLE OIL SWITCHES

for manual or remote control of

shunt capacitors, street lights, airport lighting, flood and other outdoor lighting, many other uses

100 AMPS., 15,000 VOLTS

Kyle manual (type G) and remote control (type GR) oil switches are sturdy, dependable, and provide many features that make them preferred for a wide variety of light duty load-break operations.

Quick break . . . long contact life

Both the manual and motor driven switches provide quick-break operation. Double copper-tungsten contact tips are specially designed to minimize burning and pitting, assuring long life.

Both are light weight, easy to install, and their cost is moderate. They are safe to use. Mechanism is insulated from the tank. Head and operating handle are dead, the only live parts being the top bushing terminals.

Dependable Motor Drive

The type GR has a shaded pole motor with a 115 volt 60 cycle AC circuit with a selector switch to open and close the GR from a remote point. It may be operated manually if desired. The switch uses current only during the actual on or off operation. There are no magnets or coils requiring continuous current. Three single-phase type GR switches may be used to give simultaneous switching of three-phase circuits. Other than an annual oil change and inspection, these switches require no attention and give long, dependable operation within the recommended operating cycles.

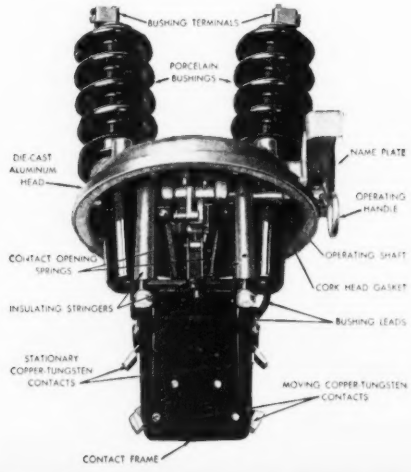
L-M'S COMPLETE OIL SWITCH LINE

Complete description, ratings, and dimensions in this handy Bulletin CR-2. Ask the L-M Field Engineer for a copy or write:

KYLE COMPANY
division of Line Material Company
Box 2077, Milwaukee 1, Wisconsin

Type GR Motor Driven Remote Control Switch

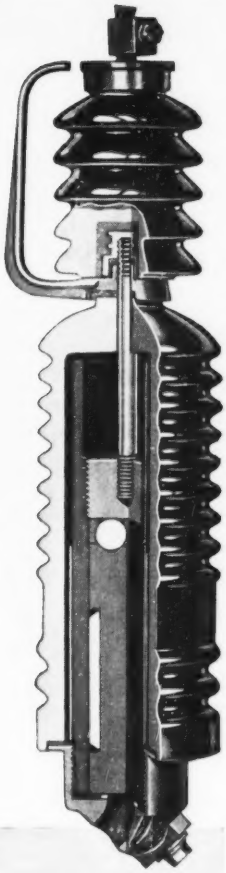
The manually operated type G looks the same except that it does not have the separately encased motor control mechanism shown on the left side. Total height, 18½"; tank 7⅛" diameter. Hangers for direct pole or cross-arm mounting.



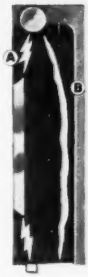
7121

LINE MATERIAL Kyle Oil Switches

Complete Coordinated Equipment for All Distribution Requirements



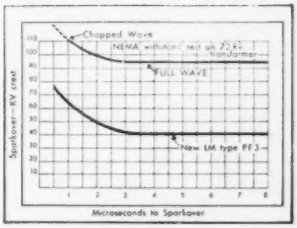
The arc that blows itself out



It's an old gag to a type PF arrester—but an arc will fall for it every time! The low sparkover distances at *A* trap the arc into a tight spot in the wedge-shaped fibre arcing chamber. The arc forms gas that blows it into a long arc at *B*—and blows it right out of the bottom vent with a bang! Works like a charm—without fail—in a half cycle or less! The arc doesn't stay at *A* long enough to burn the center electrode—so the arrester doesn't get hurt in the process. Better get the whole story—in this new Bulletin LA3. Ask the L-M Field Engineer for a copy or write Line Material Co., Milwaukee 1, Wis.

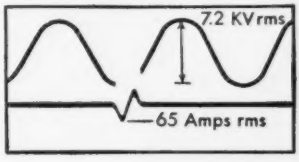
LM's new type PF3 Expulsion Arrester

Gives you lower impulse sparkover . . . greater transformer protection



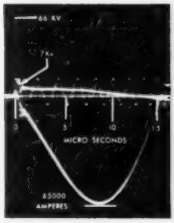
Curves at right show critical sparkover values of a 9 kv L-M PF3 arrester, compared with the minimum impulse strength of a 7200 volt transformer required by NEMA standards. Plenty of safety margin here!

PLUS
prompt interruption of follow current



Under extremely heavy lightning surges the expulsion action is so effective that the arc is blown out and follow current interrupted almost before it starts. Oscillogram shows 65 amp follow current drawn for .1 cycle with a 35000 ampere surge on a 7200 volt line with 1200 amps fault current capacity.

No limit on capacity . . . Long life



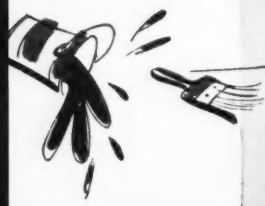
While the oscillogram shows only the NEMA-standard 65000 amp discharge test, obviously the PF3 is designed to meet this test with an ample margin of safety. ● There is no limit to the system capacity on which the PF3 may be used. ● The arc switching feature virtually prevents burning of the electrodes, assuring long life for the arrester with no appreciable increase in sparkover values.

Many Features You'll Appreciate

Heavy wet process porcelain housing with ample leakage distances . . . heavy external gap . . . Umbrella-type rain-shield is moisture-sealed above and below with heavy resin-coated gaskets . . . strong clamp-type terminals . . . Horn-fibre tube and fibre plug with wedge-shaped arc-switching chamber . . . choice of flat or cross-arm mounting hangers. In 3, 6, 9, 12, and 15 kv sizes.

LINE MATERIAL Lightning Arresters

Complete Coordinated Equipment for All Distribution Requirements



throw away
your paint brush

get ELEMEX capacitors in Stainless Steel tanks

. . . with L-M "Lifetime" solder-sealed bushings

. . . in 15 and 25 kvar sizes in standard voltage ratings

. . . LOW UNIT STRESS for long service life

One utility company estimates that it costs $8 per unit to repaint capacitors. *Whatever* it costs is *too much*—when you can get *good* capacitors like ELEMEX in *stainless steel tanks!* And that's not even considering all their other advantages. They're pretty swell jobs; we think it would be worth your time to take a good look at them!

Stainless steel tanks mean no painting, ever! They also mean that the lineman doesn't have to take time to scrape paint to get a good ground. Tanks are "Hydis" treated—for good heat dissipation.

OTHER ELEMEX ADVANTAGES

Uniform terminal elevation—another time-saving feature. The 15's and the 25's have the same terminal elevation above the hanger in each voltage class. No change in leads when you replace or mix 15 *kvar's* with 25's. The 25's are $5\frac{1}{4}$" longer *below* the hanger, so they're easy to identify from the ground. All sizes same width and thickness, fit same hanger bolts.

"Paragroove" Connectors, another L-M "first": wire is just dropped in and clamped: no crossing of leads, no loose parts. **L-M "Lifetime"** solder-sealed bushings keep air out, keep ELEMEX liquid in—permanently.

Low unit stress: conservative design assures long life. **Safer:** discharge resistors across every pack or parallel group of packs. **Individual Testing** of packs, tanks and completed capacitor before, during, and after impregnation assures uniformity, long life.

Continuous individual evacuation, drying, and capillary impregnation with ELEMEX non-inflammable dielectric assure precise control of power factor and capacitance—an exclusive L-M research development.

ELEMEX capacitors have an outstanding 5-year service record . . . negligible rate of failure . . . *not one* leaky bushing . . . and thanks to the L-M braced sealed carton, only one has broken in shipment! A good record, don't you think?

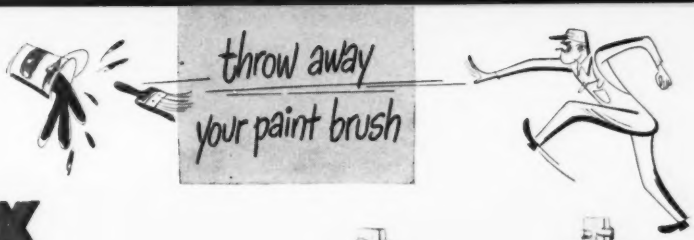
WANT MORE INFORMATION?

Want details on ELEMEX? Data on capacitor application, uses, savings, power factor calculation? L-M's engineering staff will be glad to help you. **Ask the L-M Field Engineer** to get you the information you need, ***or write*** **Line Material Co., Milwaukee 1, Wisconsin.** 6983

LINE MATERIAL Capacitors

LM

Complete Coordinated Equipment for All Distribution Requirements



ELEMEX
Capacitors
in stainless steel tanks...

do a good job...good enough to do it!

ELEMEX capacitors produce more pay load on a distribution system by supplying kilovars economically at or near the load. They cut copper losses, raise voltage, and increase carrying capacity of feeders and other equipment.

ELEMEX capacitors do this job well . . . they are good enough to do it for a long time. Highest quality, low-density paper used in each pack . . . humidity-controlled rooms . . . individual control of evacuation and capillary impregnation with ELEMEX liquid . . . step-by-step testing of each individual unit throughout production. Those are some reasons for their outstanding 5-year service record.

Many Desirable Features

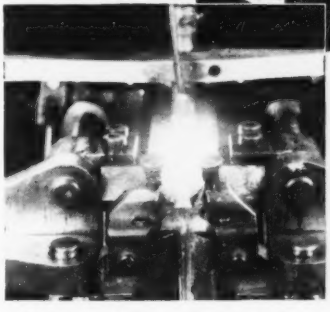
Stainless steel tanks . . . uniform terminal elevation above hangers for both 15 and 25 kvar sizes in each voltage class . . . L-M "Paragroove" connectors . . . L-M "Lifetime" solder-sealed bushings . . . sturdy, wood-reinforced shipping cartons.

Ask the L-M Field Engineer for the whole story; or write Capacitor Division, Line Material Company, Milwaukee 1, Wisconsin.

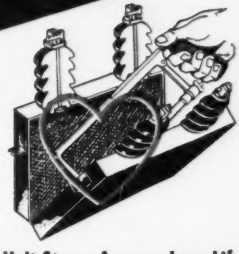
Corrosion-free Welding of Stainless Steel Tanks

ELEMEX capacitors come to you in stainless steel tanks, which never need painting. They save installation time because the lineman doesn't have to repair scratches or gouges caused by handling . . . doesn't have to scrape paint to get a good ground. And they *do* cut maintenance costs!

Tanks and covers are fabricated by the well-known Heliarc welding process. This method applied to stainless steel of very low carbon content assures a finished tank that is free of corrosion—*even at the welds.*



"Heliarc" welding of stainless steel tanks. Arc travels up one side, across, and down the other, butt-welding the seam visible in the slot in the jig.



Low Unit Stress Assures Long Life

Conservative design, with lowest stress on packs and insulation. Heavy laminated major insulation, folded at the corners without slitting, assures uniformly high impulse strength.

7130

LINE MATERIAL . . . Capacitors

Complete Coordinated Equipment for All Distribution Requirements

INSIST UPON RoBarn

THE **ORIGINAL** NEOPRENE NON-METALLIC SHEATHED CABLE

For Economy • Long Life • Safety

IN FARM WIRING

Because

Underwriters' Approved for 600 Volts

Developed by Rome Cable engineers for farm use, RoBarn is the *original* Neoprene sheathed non-metallic cable . . . the *first* to be approved for the wiring of farm buildings in one of the country's largest rural areas. Its development ended a long search for a wiring material resistant to the effects of moisture, ammonia fumes, and temperature changes found in live stock buildings. RoBarn eliminates the need for expensive rewiring . . . the hazards of defective circuits.

Underwriters' approved as Non-metallic Sheathed Cable having "adequate fungus resistant and other necessary properties for use in cow barns and *other locations where it would be subject to conditions of heat, cold, moisture, corrosive fumes and fungus*" . . . RoBarn has many general purpose applications as described in the National Electrical Code, Article 336. Its all-Neoprene construction, with reinforcing glass braid, resists flame, moisture, acids, and mechanical injury. It is stronger . . . electrically and physically . . . than conventional Non-metallic Sheathed Cable. It is a quality product made for dependable service.

Get the *best* by insisting upon the *original* . . . ask for RoBarn.

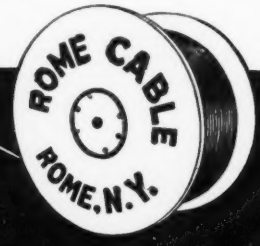
- **RoBarn** cannot rot, mold, oxidize . . . it will neither absorb moisture nor support flame.
- **RoBarn** resists humidity, chemical fumes, acids . . . it is unaffected by extreme temperature changes.
- **RoBarn** is easy to handle . . . simple to strip . . . has uniformly small diameters for easy connection in outlet boxes.
- **RoBarn** is stronger . . . more durable . . . its conductors are cushioned against mechanical injury.

Available from stock in sizes 14, 12, and 10 AWG . . . two and three conductors. Write for descriptive folder, or call your nearest Rome Cable office today.

FROM BAR TO FINISHED WIRE

ROME CABLE CORPORATION

ROME • NEW YORK

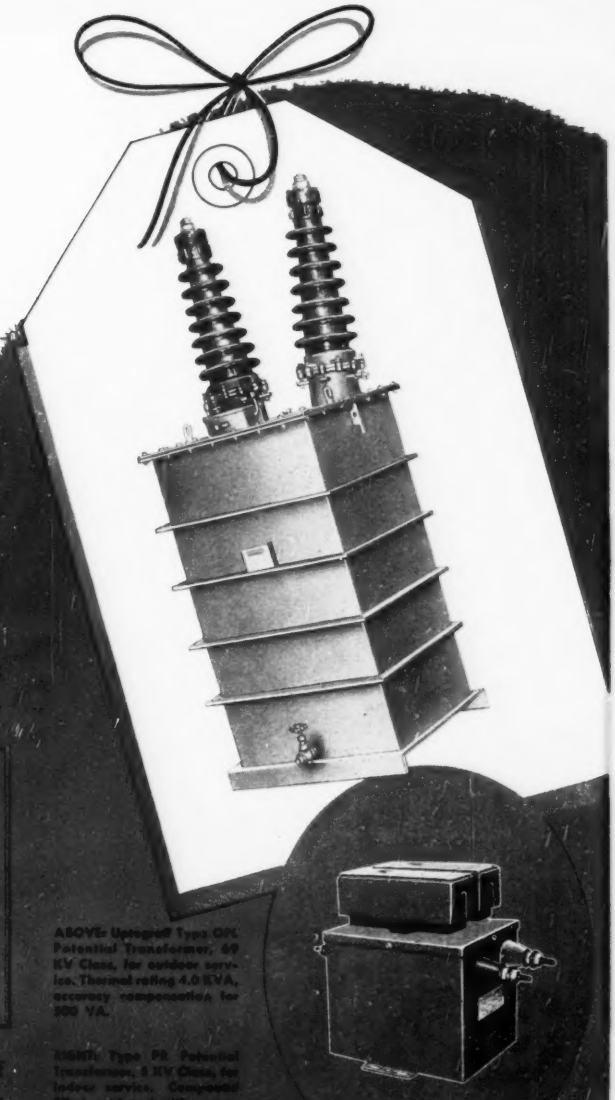


Uptegraff potential transformers

Uptegraff Po[illegible] are made in siz[illegible] volts. They are built w[illegible] an extra margin of in[illegible] sulation st[illegible]gth, as a safeguard against severe ove[illegible]oltage and line fluctuations.

Units rated [illegible] more than 7200 volts:

- ★ **Supplied either oil or askarel-fi[illegible] as desired**
- ★ **Vacuum-impregnated coils; vacuu[illegible]filled tank**
- ★ **Units [illegible] 69 KV Class provided with tank suitable for vacuum filling in the field**



ABOVE: Uptegraff Type OPL Potential Transformer, 69 KV Class, for outdoor service. Thermal rating 4.0 KVA, accuracy compensated for 300 VA.

RIGHT: Type PR Potential Transformer, 5 KV Class, for indoor service. Compound filled, equipped with removable cartridge fuses.

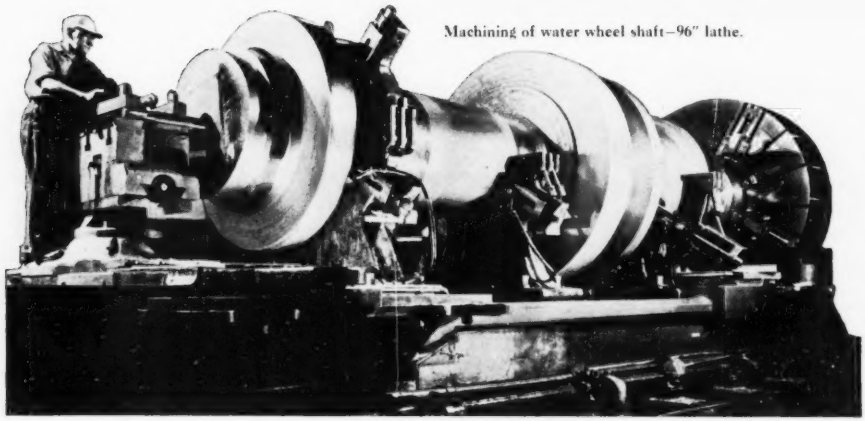
The tank shown above is typical of Uptegraff design, with extra ribbing to add strength and permit vacuum filling in the field if, for any reason, the oil is drained and refilling becomes necessary.

Sizes and types are available for all classes of indoor and outdoor service.

Write for details and complete data.

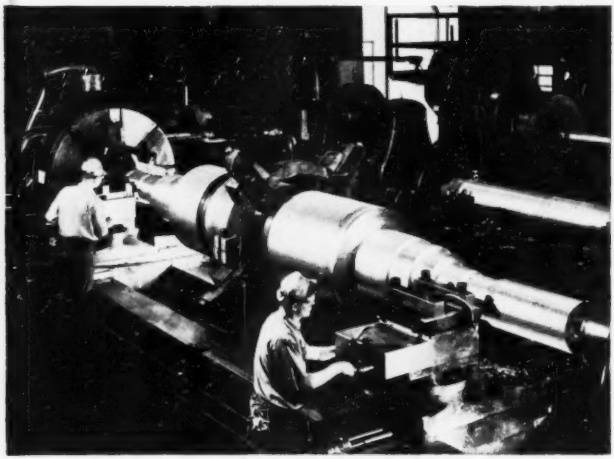
UPTEGRAFF
Transformers
Power · Distribution
Specialty · Instrument

R. E. UPTEGRAFF MANUFACTURING COMPANY · *Scottdale, Pennsylvania*



Machining of water wheel shaft—96" lathe.

heavy FORGINGS
to your specifications



Turning generator shaft—60" lathe.

GENERATOR shafts . . . water wheel shafts . . . rotors . . . pinions . . . reduction gears . . . ship shafting, are only a few of the great variety of quality forgings regularly produced at the Homestead Works of Carnegie-Illinois Steel Corporation.

For these, and many other jobs, we make the steel, we forge it, and, if desired, will machine it to your specifications.

We cast ingots up to 110 inches in diameter. Our facilities include the most modern heat-treating furnaces . . . hydraulic presses of 2,000, 3,000, 7,000, and 12,000-ton capacities . . . and all the necessary turning, boring, and planing equipment.

As for personnel, the men in our shop not only have long experience, but are generally recognized as authorities in the forging field. This combination of men and equipment is your assurance that you will get the forging you want . . . *exactly as you want it.* We'd like to talk over your forging needs with you. There's no obligation, of course. Why not get in touch with us at once?

CARNEGIE-ILLINOIS STEEL CORPORATION, PITTSBURGH & CHICAGO
COLUMBIA STEEL COMPANY, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM, SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

Commercial Forgings

UNITED STATES STEEL

YOU GET UNEQUALLED SERVICE WITH GOULD PLANTÉ

See that Planté plate? It's the only pure lead positive plate in any battery . . . and is the reason why Gould Planté delivers unfailing power for more years, at lower cost, than any other battery.

Only Planté pure lead positives contain no antimonial impurity to contaminate negative plates. Such contamination cuts battery capacity, builds up required float voltage, and shortens battery life.

That's why Gould Planté batteries consistently roll up amazing service records wherever they are used. That's why Planté batteries are the Aristocrats of Stationary Batteries.

OTHER GOULD TYPES—Planté, Kathanode and Dreadnought—offer a complete line to cover all capital expenditure, service, capacity and cost requirements. Our "Battery Selector," GB-852, gives full information. Write for your copy today.

GOULD

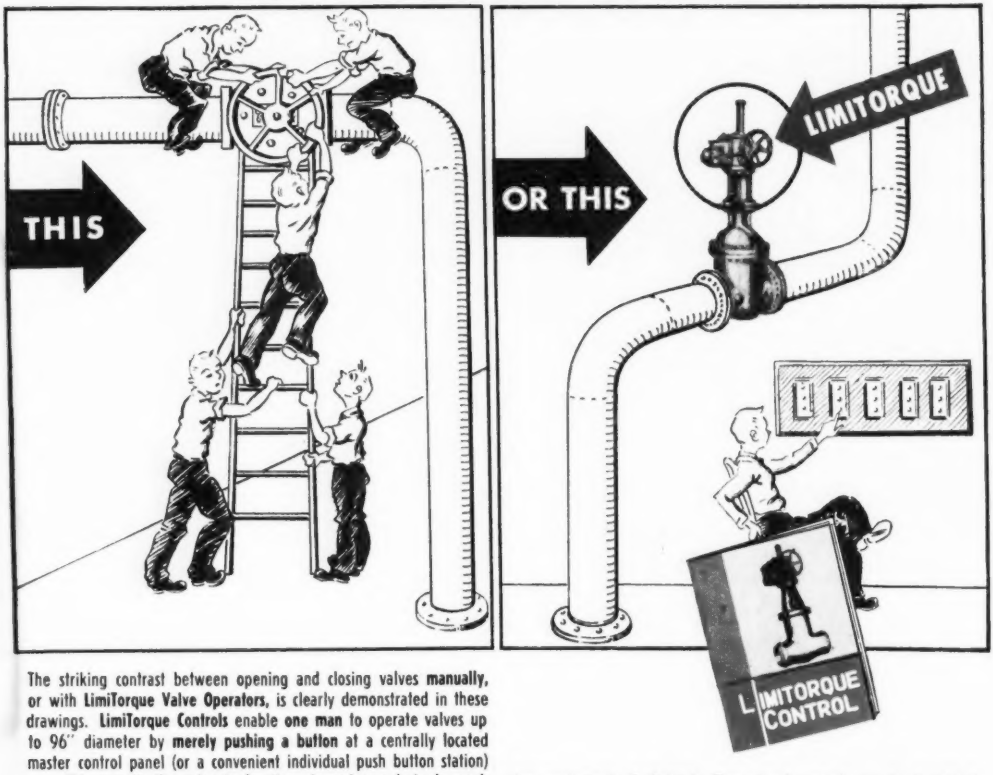
STORAGE BATTERY CORPORATION

TRENTON 7, NEW JERSEY

Always Use Gould Automobile and Truck Batteries

Which method of valve operation is safe, sure..

...and SAVES *time... trouble... money...*



The striking contrast between opening and closing valves **manually,** or with **LimiTorque Valve Operators,** is clearly demonstrated in these drawings. **LimiTorque Controls** enable **one man** to operate valves up to 96" diameter by **merely pushing a button** at a centrally located master control panel (or a convenient individual push button station) . . . This permits the valve to function at maximum desired speed, while eliminating all physical efforts and hazards to the workmen.

Remote operation of valves from one central point, with a full knowledge of their **status at all times,** is possible with **LimiTorque.** There are several types of **LimiTorque Controls** applicable for operating all types and sizes of valves, and which can be adapted to existing equipment, if desired. Floor stand controls can be furnished where it is not practical to fit the controls directly to the valve yokes.

Thousands of **LimiTorques** are used in water and sewerage works, central stations, private power plants, oil pipelines and refineries, on ships, etc. Send for our 96-page catalog, and please use your Business Letterhead when writing for same.

Philadelphia Gear Works, INC.

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.

NEW YORK • PITTSBURGH • CHICAGO • HOUSTON

IN CANADA: WILLIAM AND J. G. GREEY LIMITED, TORONTO

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

AVAILABLE SOON

. . . reserve your copy now

BTC's new catalog of Drop Forged Hi-Line Hardware will soon be coming off the press. The first edition to appear since the war, it contains valuable information you'll want to have on hand for ready reference—pictures, blueprints and complete specifications on BTC's entire line of Drop Forged Steel, Aluminum and Bronze Hi-Line Hardware.

This 40-page BTC catalog will be sent to you without charge by the company that pioneered the first and only full line of standard drop forged high-line hardware. Simply fill in and mail the coupon below — but do it now, so that your copy can be mailed when it's ready.

THE BREWER-TITCHENER CORPORATION
CORTLAND, NEW YORK
Metal Products Manufacturers for over 100 Years

THE BREWER-TITCHENER CORPORATION
CORTLAND, NEW YORK

Please reserve my copy of the new BTC hi-line hardware catalog.

NAME _____ TITLE _____

COMPANY _____

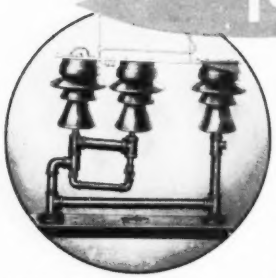
STREET _____

CITY _____ ZONE _____ STATE _____

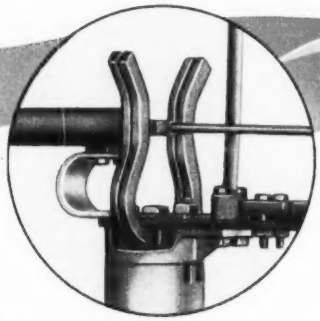
R&IE *AGAIN* Makes History

with the MODERN

1910 1922

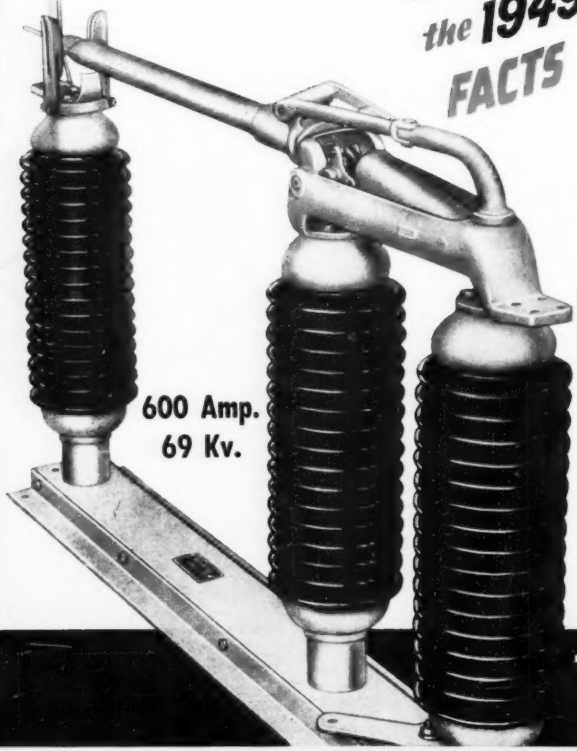


1910—R&IE introduced the "Burke" switch—the forerunner of today's outdoor switching equipment



1922—R&IE introduced the Hi-Pressure contact, an important improvement in switch design

CHECK the 1949 FACTS



600 Amp.
69 Kv.

1 JAW CONTACT—Hi-Pressure, Hi-Thermal capacity silver to copper contact. ONLY ONE BREAK CONTACT on the switch. Copper and beryllium jaw—copper for thermal capacity and beryllium for strength and resilience. Here's maximum protection against fault current damage.

2 HINGE CONTACT—Completely enclosed and weather sealed Hi-Pressure, Hi-Thermal capacity, silver to copper Hinge Contact. Continuous, annular, constant electrical and mechanical contact at all times. Eliminates second break contact with its multiplied problems and maintenance.

3 BLADE OPERATING MECHANISM—Simplified and "streamlined" to attain a simple harmonic, accurately controlled blade motion. Special pin fastenings, snap rings, and rivets have been eliminated from moving parts. Universal blade balance on 69 Kv. and above.

4 BLADE—Extra heavy, hard drawn tubular copper with integral, formed contact end. Solid current path from jaw to hinge contact.

5 TERMINALS—Four half-inch bolts on 1¾ x 1¾ inch centers permit NEMA standard 600 or 1200 Ampere clamping and R&IE Type "UC" universal clamps. Both terminals equal height from base.

6 BEARING—Aluminum housed, weather sealed, stainless ball—requires no lubrication.

THE SWITCH DESIGNED

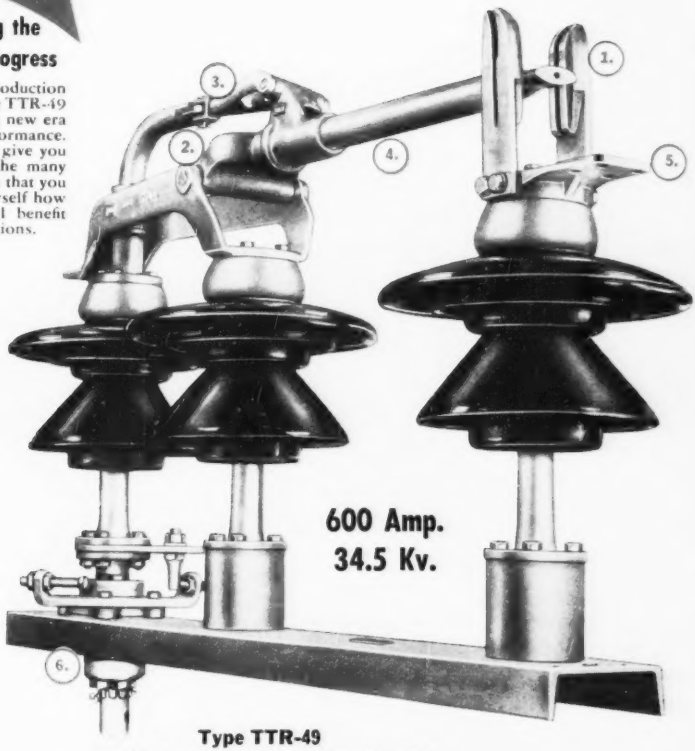
PIONEER

The NEW Type TTR-49 Disconnecting Switch with Sealed Pressure Hinge Contact

1949

Continuing the March of Progress

In 1949, the introduction of the R&IE type TTR-49 Switch begins a new era of switch performance. We will gladly give you full details of the many new features, so that you can see for yourself how its use will benefit your operations.



Type TTR-49

Available for delivery after October 1st, 1949

RAILWAY and INDUSTRIAL ENGINEERING CO., GREENSBURG, PA.

IN CANADA – EASTERN POWER DEVICES LIMITED, TORONTO

An I-T-E ORGANIZATION

39 Years of Switch Progress

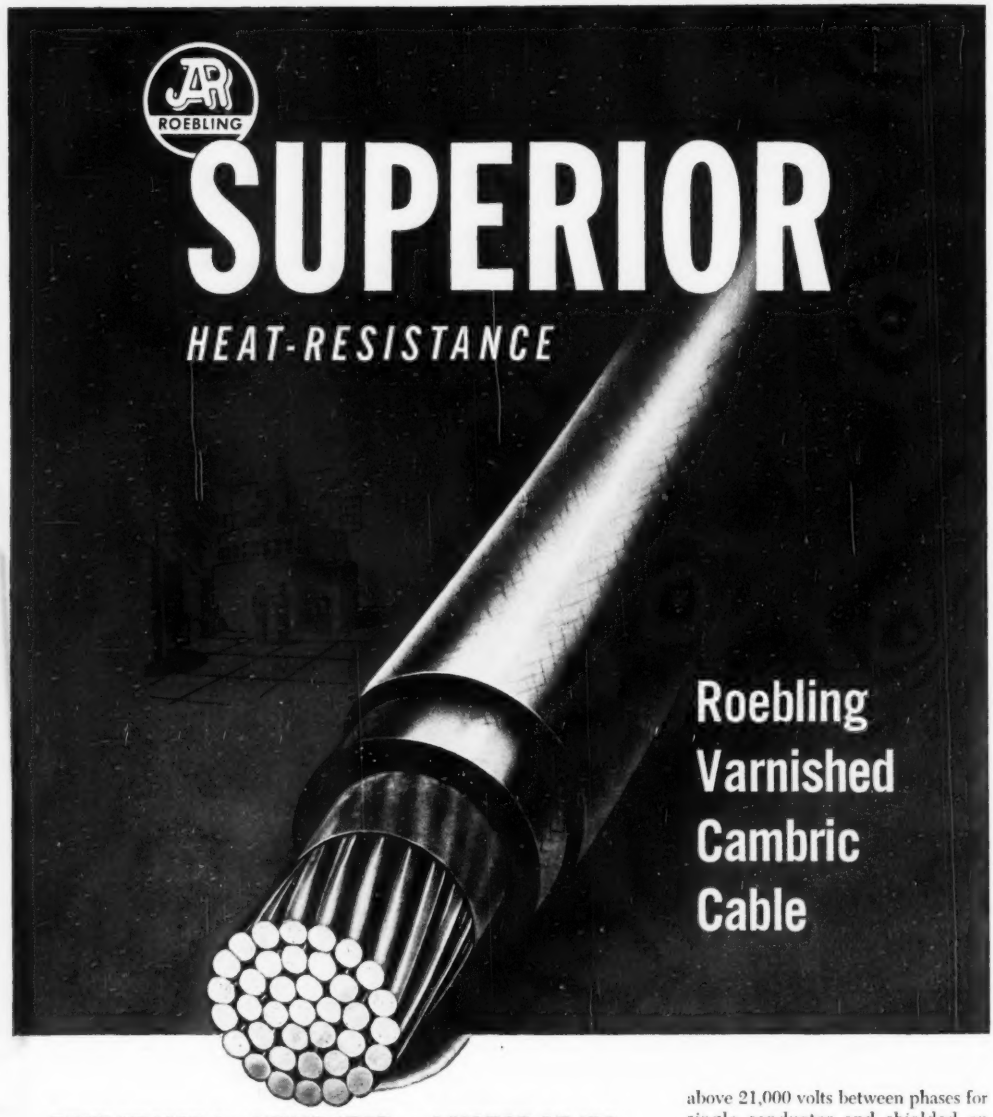
Built for Outstanding Performance for the Years to come

WITH YOUR OPERATING PROBLEMS IN MIND

JR ROEBLING

SUPERIOR

HEAT-RESISTANCE



BEST CHOICE for GENERATOR and MOTOR LEADS

FOR THE TORRID ZONES in power, heat and lighting circuits, Roebling Varnished Cambric Cable is your one best choice. The heat resistance of Varnished Cambric gives top efficiency on leads for generators, motors, transformers and oil switches.

You can have Roebling Varnished Cambric Cable in single or multiple conductor types . . . single, from 2,000,000 C. M. to No. 14 A.W.G. Both constructions are adapted for use not above 17,000 volts between phases for unshielded multiple conductor . . . not above 21,000 volts between phases for single conductor and shielded on ungrounded neutral; and not above 28,000 volts between phases for single conductor and shielded on grounded neutral.

Write for detailed information, or contact with your Roebling Distributor—he'll be glad to help. John A. Roebling's Sons Company, Trenton 2, N. J.

WRITE OR CALL THE ROEBLING FIELD MAN AT YOUR NEAREST ROEBLING OFFICE AND WAREHOUSE

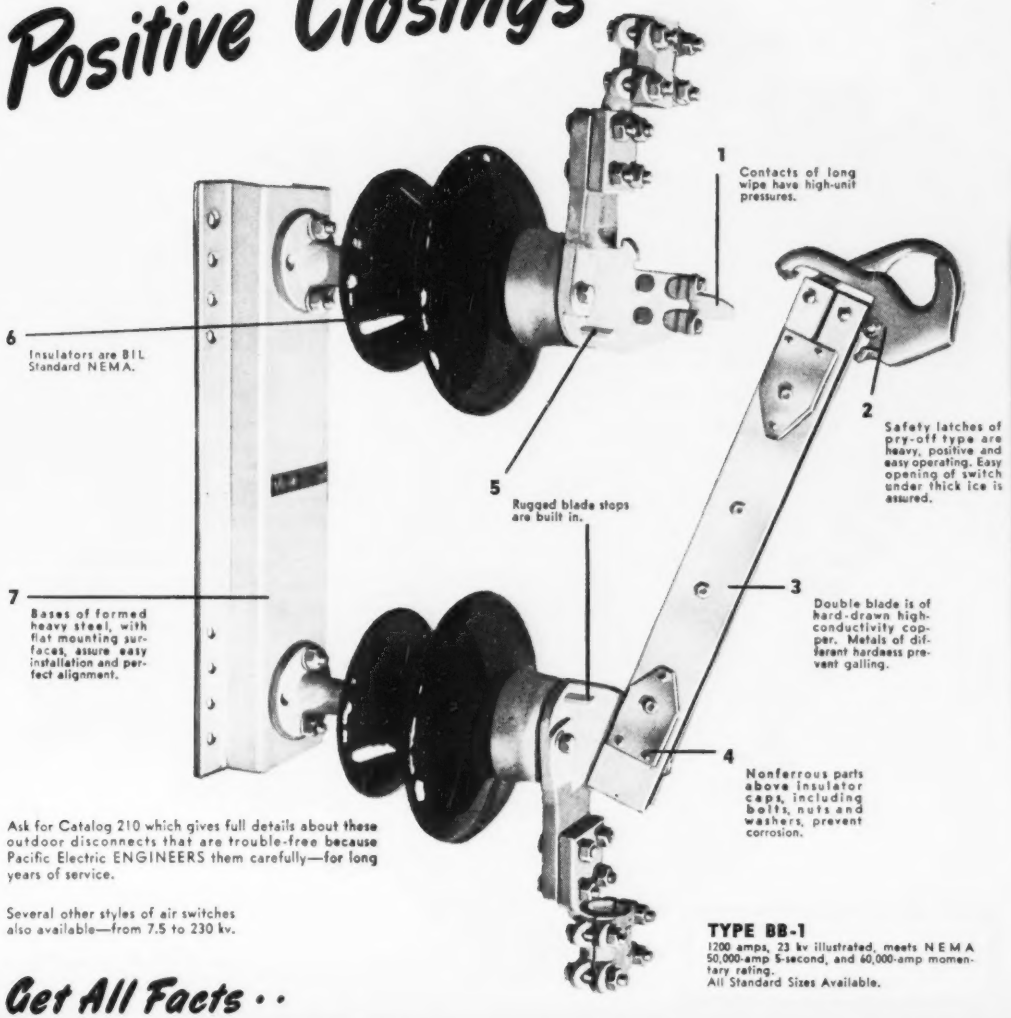
Atlanta, 934 Avon Ave. ★ ***Boston,*** 51 Sleeper St. ★ ***Chicago,*** 5525 W. Roosevelt Rd. ★ ***Cleveland,*** 701 St. Clair Ave., N. E. ★ ***Denver,*** 1635 17th St. ★ ***Houston,*** 6216 Navigation Blvd. ★ ***Los Angeles,*** 216 S. Alameda St. ★ ***New York,*** 19 Rector St. ★ ***Philadelphia,*** 12 S. 12th St. ★ ***Pittsburgh,*** 855 W. North Ave. ★ ***Portland, Ore.,*** 1032 N. W. 14th Ave. ★ ***San Francisco,*** 1740 17th St. ★ ***Seattle,*** 900 First Ave.

ROEBLING

☆ *A CENTURY OF CONFIDENCE* ☆

OUTDOOR DISCONNECTS

Easy, Pry-Off Openings— Positive Closings


1
Contacts of long wipe have high-unit pressures.
2
Safety latches of pry-off type are heavy, positive and easy operating. Easy opening of switch under thick ice is assured.
3
Double blade is of hard-drawn high-conductivity copper. Metals of different hardness prevent galling.
4
Nonferrous parts above insulator caps, including bolts, nuts and washers, prevent corrosion.
5
Rugged blade stops are built in.
6
Insulators are BIL Standard NEMA.
7
Bases of formed heavy steel, with flat mounting surfaces, assure easy installation and perfect alignment.

Ask for Catalog 210 which gives full details about these outdoor disconnects that are trouble-free because Pacific Electric ENGINEERS them carefully—for long years of service.

Several other styles of air switches also available—from 7.5 to 230 kv.

TYPE BB-1
1200 amps, 23 kv illustrated, meets NEMA 50,000-amp S-second, and 60,000-amp momentary rating.
All Standard Sizes Available.

Get All Facts . .

Call

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PIERCE G. FREDERICKS, 90 West St., New York 6, N. Y.
J. E. REDMOND SUPPLY CO., 625 W. Madison St., Phoenix, Ariz.
G. B. KIRKWOOD, 437 S. Hill St., Los Angeles 13, Calif.
MARRS & WENDEGATZ, 526 Dwight Bldg., Kansas City 6, Mo.
KRIPPNER and POLLEY, 1 Downing St., Denver 9, Colo.
F. W. GORMAN, P. O. Box 223, El Paso, Texas
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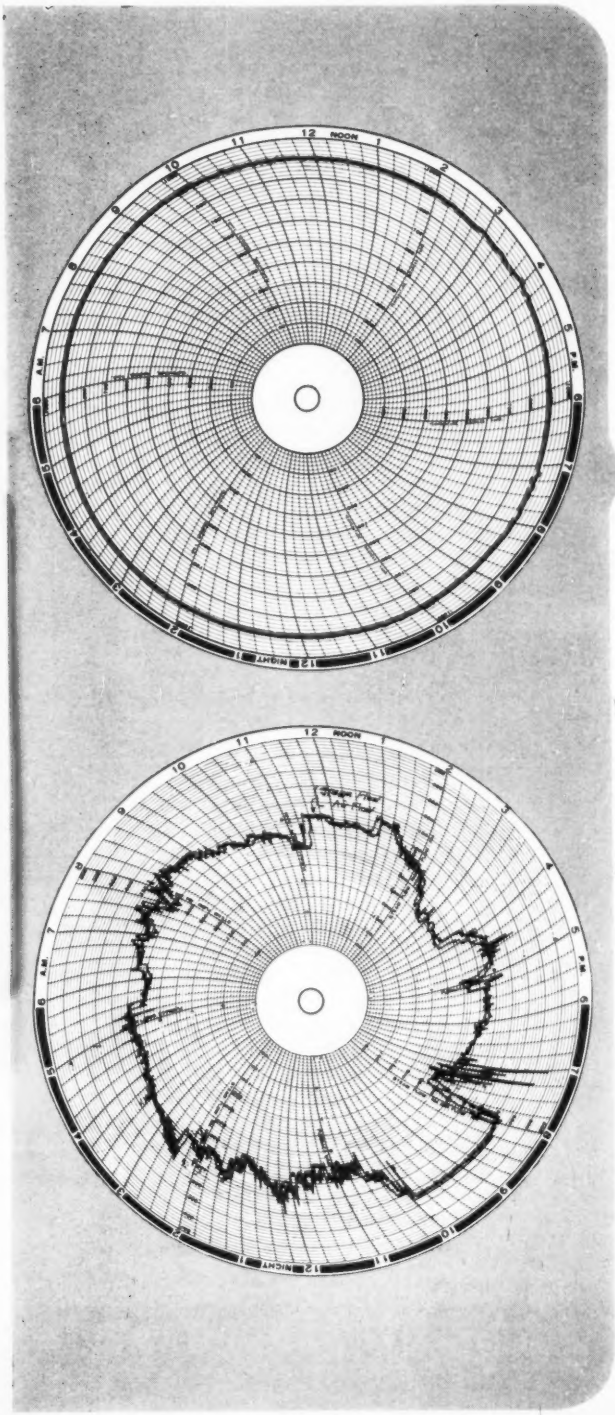
C. C. MUSGROVE, 506 Southland Bldg. Annex, Dallas 1, Texas
WILLIAMSON & WILMER INC., 617 Mutual Bldg., Richmond 19, Va.
EDGAR F. HUBERT CO., 510 Statler Bldg., Boston 16, Mass.

Other Representatives in Principal Cities



Precision

MAINTAINED

Typical steam-temperature chart from a large central station boiler equipped with B&W Spray Atemperators shows uniformity of final superheat temperature.

Steam-flow chart shows wide load variations on the same boiler throughout the corresponding period of operation.

SERVICE-PROVED ON OVER

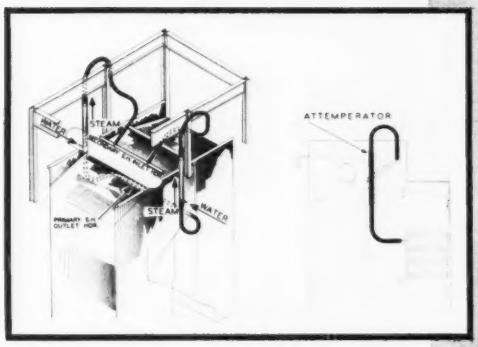


Fig. 1: Intermediate location of attemperator reduces alloy requirements . . . overcomes unbalanced temperature conditions in second stage superheater.

Control of Superheat

WITH B&W SPRAY ATTEMPERATORS

For many high-temperature boiler installations, B&W Intermediate Spray Attemperation provides the most effective means of superheat control, and often at demonstrably lower cost than other types. Located between primary and secondary superheaters, Spray Attemperators offer the obvious economy of reduced alloy-tube requirements by maintaining uniform tube temperatures in the second stage, where temperatures are highest (see Fig. 1). Harmful impingement of spray water on pressure-piping surfaces is effectively prevented by a special venturi liner, which also assures rapid evaporation of the spray water and dry steam to the second stage superheater (see Fig. 2).

These facts help explain why so many power companies prefer B&W Spray Attemperation. Have your B&W representative explain fully its advantages for safe, efficient high-temperature operation.

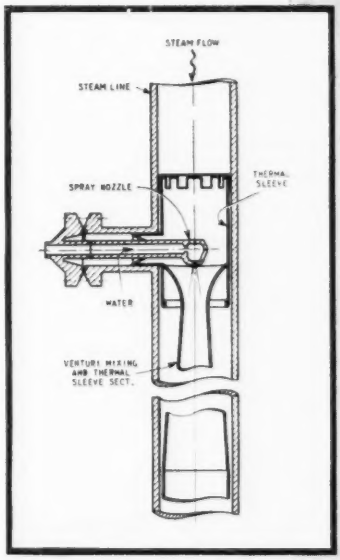


Fig. 2: Special venturi-shaped liner mixes atomized spray with steam, away from direct contact with pressure piping surfaces.

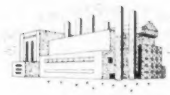
BABCOCK & WILCOX

100 BOILERS SERVING OVER 5½ MILLION KW. OF GENERATING CAPACITY

G-457

ASSETS

not on Balance Sheets



In fifty years a business gathers assets not found on any balance sheet. One we rate at the top is manpower—the selected, trained and tested men of the Bechtel "family" who have moved up through the ranks to positions of leadership.

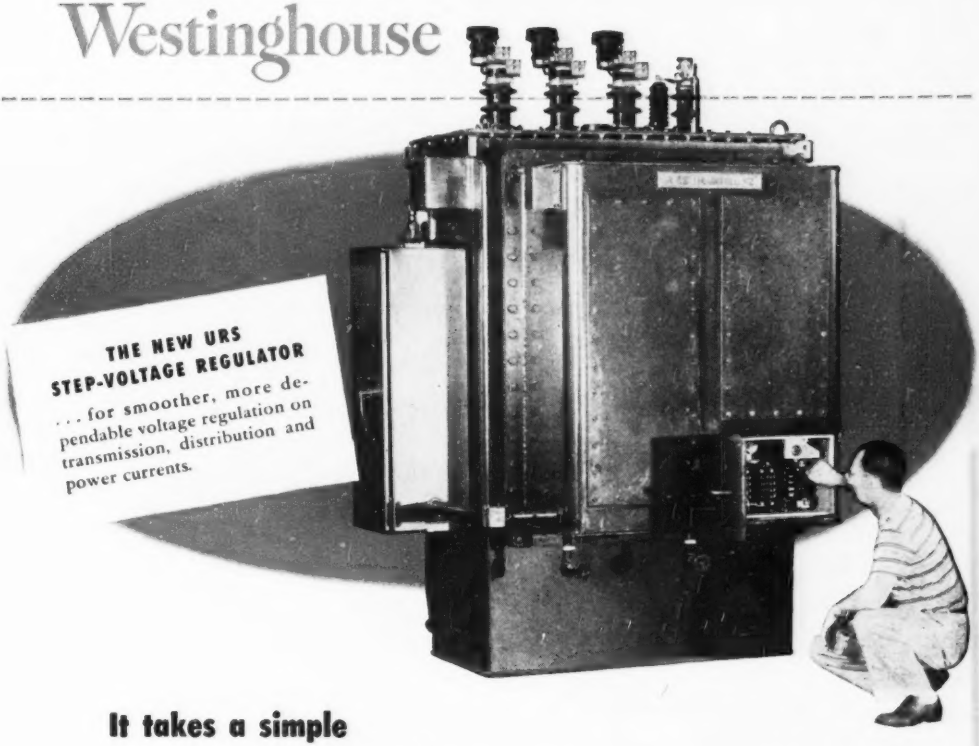
Their combined experience covers all principal fields of engineering and construction. To use it effectively, Bechtel policy makes available for each job the men best qualified by knowledge, special skills and past performance, and backs the project team with headquarters services and centralized responsibility.

BECHTEL CORPORATION

LOS ANGELES · SAN FRANCISCO · NEW YORK

YOU CAN BE SURE.. IF IT'S

Westinghouse


THE NEW URS
STEP-VOLTAGE REGULATOR
. . . for smoother, more dependable voltage regulation on transmission, distribution and power currents.

It takes a simple

Direct Drive

for Lasting Dependability

Help increase the efficiency of your customers' electrical apparatus. Realize greater customer satisfaction *and* increased revenue! Give them economical, dependable voltage regulation with the new URS Step-Voltage Regulator . . . equipment you can count on for:

Lasting Dependability—because URS Tap-Changer provides *positive action.* The unusual simplicity of the direct-connected drive reduces potential trouble sources to a minimum.

Minimum Wear—because high contact speeds and contact tips of special arc-resistant alloys minimize erosion due to arcing.

Minimum Care—because wearing parts are carefully designed for longer life. All parts are readily accessible. The Tap-Changer may be inspected by removing conveniently located inspection plates.

There's a Westinghouse voltage regulator to meet every requirement. Get the complete story. Write for B-4245, C.S. 47-225, D.B. 47-310 and D.B. 47-410. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-70531

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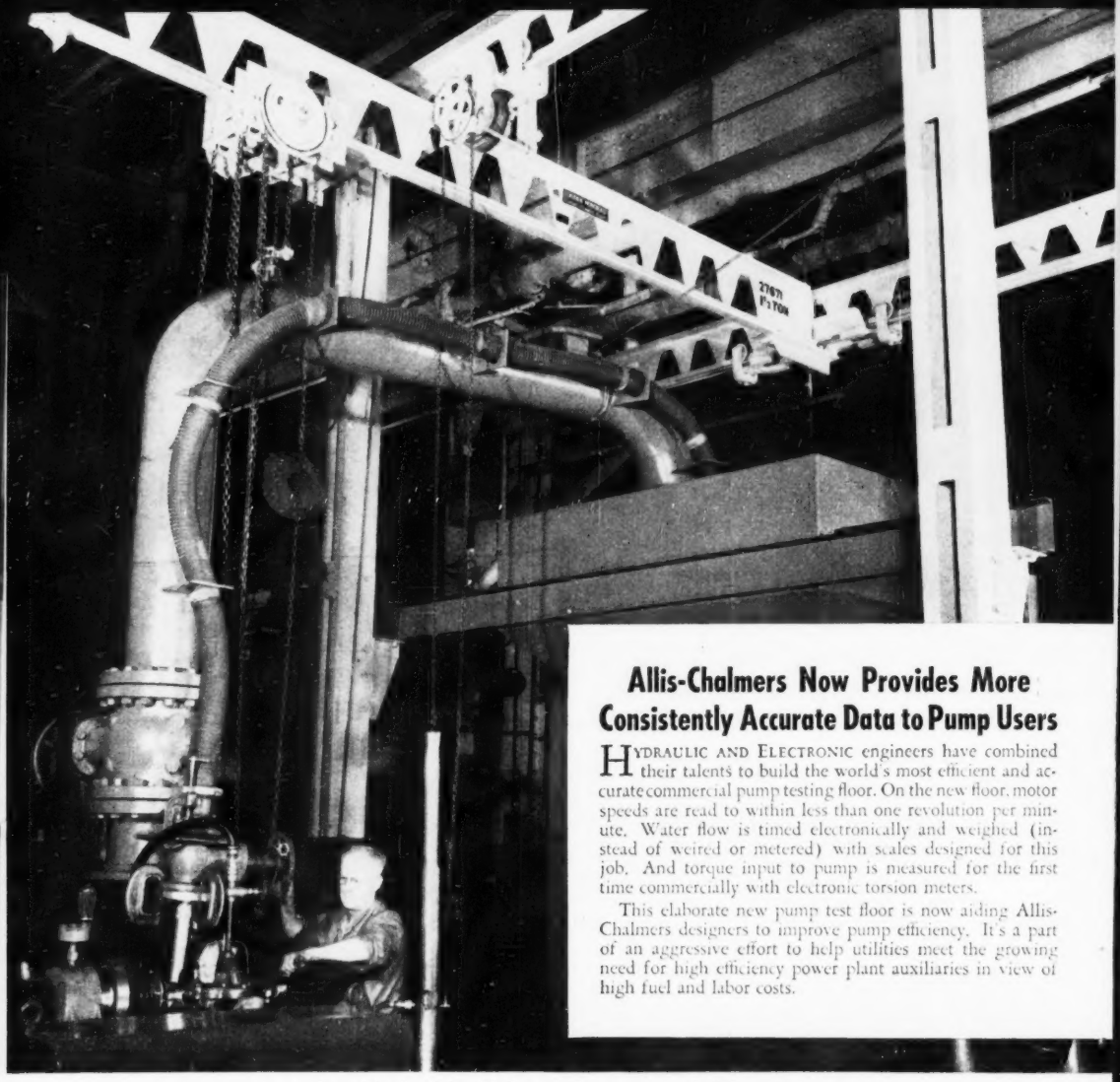
VOLTAGE REGULATORS FOR *ANY* SYSTEM

Allis-Chalmers Builds for Electric Utility Progress . . .

Worlds Finest



Allis-Chalmers Now Provides More Consistently Accurate Data to Pump Users

HYDRAULIC AND ELECTRONIC engineers have combined their talents to build the world's most efficient and accurate commercial pump testing floor. On the new floor, motor speeds are read to within less than one revolution per minute. Water flow is timed electronically and weighed (instead of weired or metered) with scales designed for this job. And torque input to pump is measured for the first time commercially with electronic torsion meters.

This elaborate new pump test floor is now aiding Allis-Chalmers designers to improve pump efficiency. It's a part of an aggressive effort to help utilities meet the growing need for high efficiency power plant auxiliaries in view of high fuel and labor costs.

Water is pumped into tanks at right where it is weighed to provide more accurate check than weiring or metering.

1933 — 5/8% Step Regulator was introduced by A-C. Set new standards for voltage regulation. Over 5,000,000 kva now regulated by A-C 5/8% step units.

1949 — New Pole Type 5/8% Step Regulator introduced by A-C. Makes possible close, automatic city type voltage regulation in rural areas for first time.

ALLIS-

Pioneers in Power

Pump Test Floor

In addition, the new test floor removes the human element from routine testing of production pumps . . . provides more consistently accurate data than was heretofore possible.

For years Allis-Chalmers has maintained files of complete performance data on every pump it builds. The new test floor now assures Allis-Chalmers pump buyers of a completely mechanical check of performance unequalled anywhere.

All of this is done in the interest of providing better facilities . . . better products . . . better service for the Electric Power industry.

Take advantage of the benefits of these new facilities. Investigate the pumps A-C builds for the power plant. They range from small general purpose and ash slurry pumps up to the largest circulating and boiler feed designs. Call in an A-C engineer to talk over your pumping problems with you.

A-2851

ALLIS-CHALMERS, 932A SO. 70 ST.
MILWAUKEE, WIS.

Accurate recording instruments in new control room remove human element from test procedures.

CHALMERS

A-C ALLIS-CHALMERS

and Electrical Equipment from Generation through Utilization

A STACK THAT REALLY IMPROVES YOUR BOILER *Efficiency*

The Stack, fan and breeching are each only a *part* of an induced draft system. Separately built, they do not always provide the coordinated effort necessary for the most efficient draft that is possible.

Prat-Daniel Fan Stacks, however, offer an integrated induced draft system, combining the three elements of stack, breeching and I.D. fan, into one complete induced draft unit, each component designed to work with the other to produce the highest efficiency.

Prat-Daniel Fan Stacks are built to give your boiler a predetermined draft without excessive "safety factors" necessary with un-coordinated systems. They are completely fabricated and guaranteed by one responsible company . . . a company that has been designing and manufacturing draft-producing equipment for over a quarter of a century.

Write for the Prat-Daniel catalog on Fan Stacks.

Project and Sales Engineers

THE THERMIX CORPORATION

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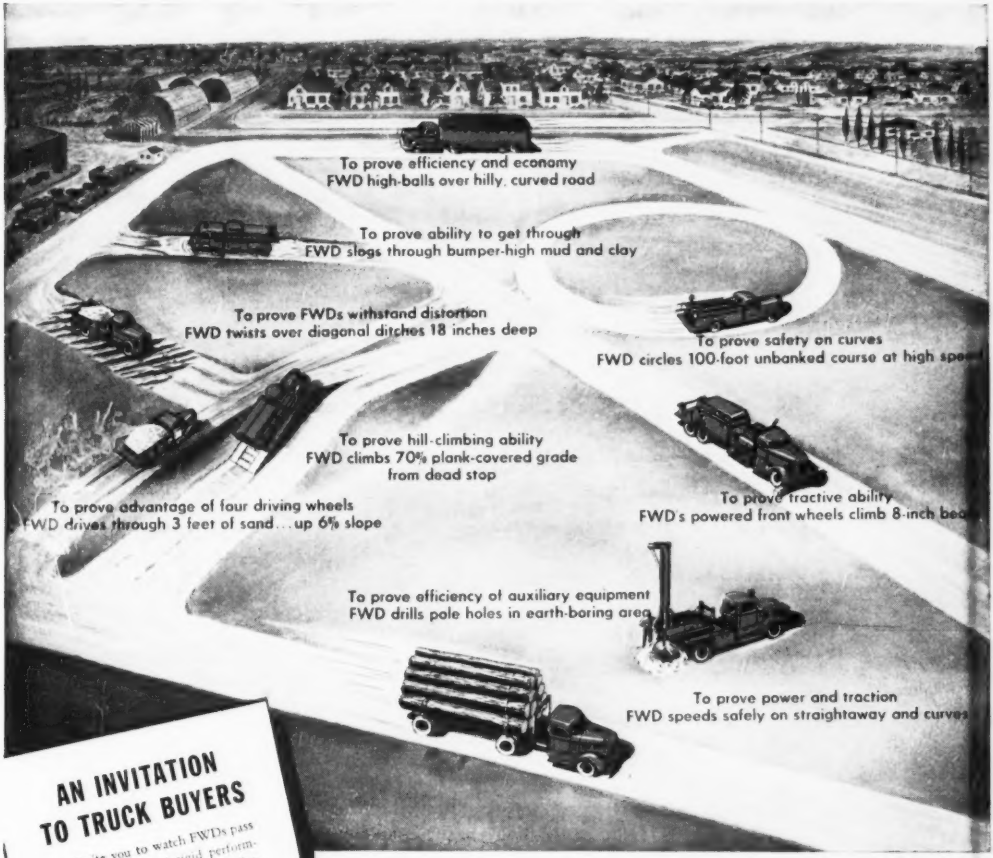
DESIGNERS AND MANUFACTURERS OF POWER PLANT EQUIPMENT FOR OVER 25 YEARS

PROOF - *not Guesswork*

Makes FWD America's Foremost Heavy-Duty Truck


To prove efficiency and economy
FWD high-balls over hilly, curved road
To prove ability to get through
FWD slogs through bumper-high mud and clay
To prove FWDs withstand distortion
FWD twists over diagonal ditches 18 inches deep
To prove safety on curves
FWD circles 100-foot unbanked course at high speed
To prove hill-climbing ability
FWD climbs 70% plank-covered grade
from dead stop
To prove advantage of four driving wheels
FWD drives through 3 feet of sand...up 6% slope
To prove tractive ability
FWD's powered front wheels climb 8-inch bea
To prove efficiency of auxiliary equipment
FWD drills pole holes in earth-boring area
To prove power and traction
FWD speeds safely on straightaway and curves

AN INVITATION TO TRUCK BUYERS

We invite you to watch FWDs pass a series of the most rigid performance tests. Ask your FWD distributor to arrange for you to visit our plant. Or — if you can't get away, ask him to show you the movie, *The FWD Story*. In either case, you will see for yourself how FWD trucks can help solve your heavy-duty trucking problems.

Walter A. Olen
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The Four Wheel Drive Auto Co.

YOU want to know that your truck can climb steep grades . . . drive through deep snow, mud or sand . . . get you through to off-the-road locations. You want to know it can speed heavy loads safely over slippery highways . . . that it can get you around sharp curves without skidding. You want to know your truck has the stamina to insure long life . . . that it will do it without expensive mechanical breakdowns.

You can be sure it will if it's an FWD! What's more, with FWDs, you can be sure of these advantages — *even before you buy.* And here's why. On FWD's proving ground, you get proof — *not guesswork* — of what an FWD will do for you. A series of scientifically designed torture tests duplicates every operating condition you're liable to meet. Yes . . . FWDs prove themselves thoroughly.

Find out what this can mean to you. See your FWD distributor — or write direct for complete facts about FWD Trucks.

THE FOUR WHEEL DRIVE AUTO COMPANY
Clintonville, Wisconsin
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FOUR AND SIX WHEEL DRIVE TRUCKS

America's Foremost Heavy-Duty Truck

CENTRAL
~~SPANG~~
CONDUIT

Your Central Rigid Steel Conduit Distributor is proud of his reputation for service. And he fights to maintain that reputation even if it means extra hours or personal inconvenience to take care of emergencies for you.

But that's only one of the reasons that he's a good man to know. You'll find that he maintains balanced stocks of quality electrical supplies . . . like Central Rigid Steel Conduit that's approved by the National Electrical Code as moisture, vapor and dust tight for use in hazardous locations and occupancies.

When you need conduit or other electrical supplies, contact your Central Conduit Distributor first. You'll find that he's a dependable source of supply.

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Division of The National Supply Company
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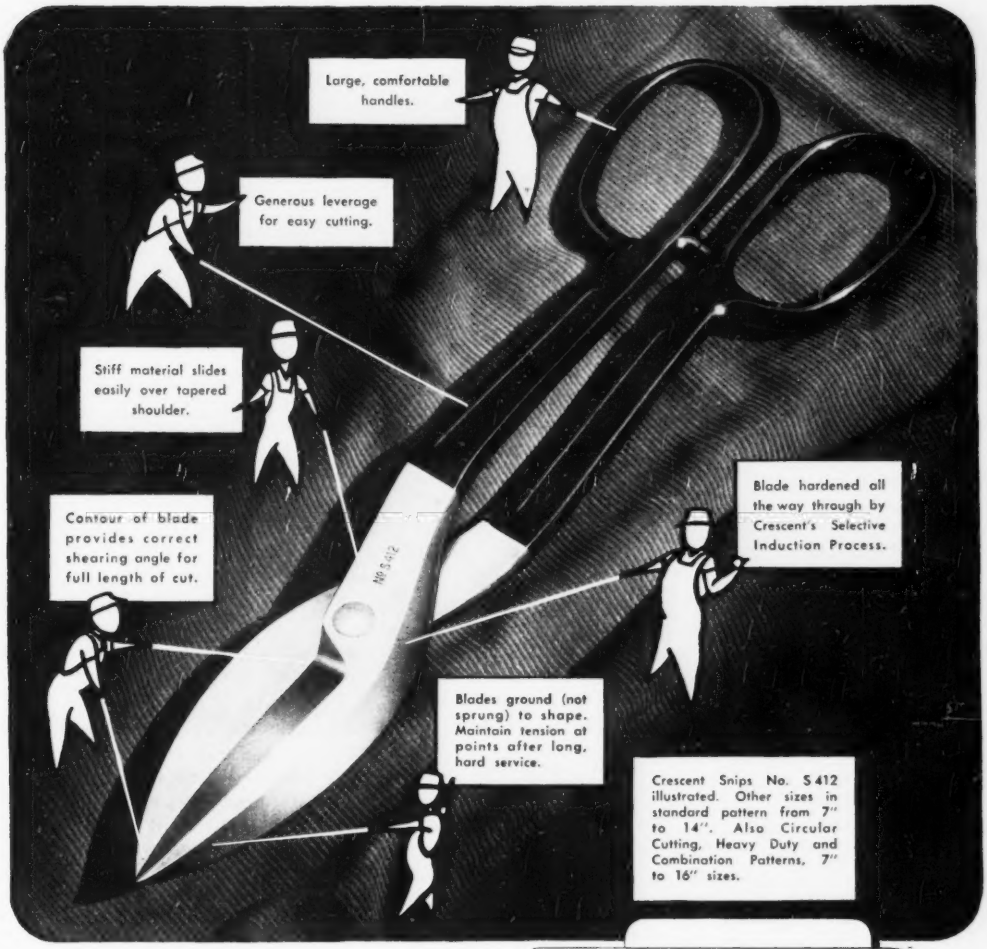
CENLACO a hot dipped galvanized and lacquered finish, inside and out.

CENTRAL WHITE electro-galvanized outside and black enameled inside.

CENTRAL BLACK permanent, baked-on black enamel finish, inside and out.

CRAFTSMEN RECOGNIZE QUALITY *by these fine features in* TINNER'S SNIPS


Large, comfortable handles.
Generous leverage for easy cutting.
Stiff material slides easily over tapered shoulder.
Contour of blade provides correct shearing angle for full length of cut.
Blade hardened all the way through by Crescent's Selective Induction Process.
Blades ground (not sprung) to shape. Maintain tension at points after long, hard service.
Crescent Snips No. S 412 illustrated. Other sizes in standard pattern from 7" to 14". Also Circular Cutting, Heavy Duty and Combination Patterns, 7" to 16" sizes.

EVERYBODY RECOGNIZES QUALITY *by this Trade-mark*

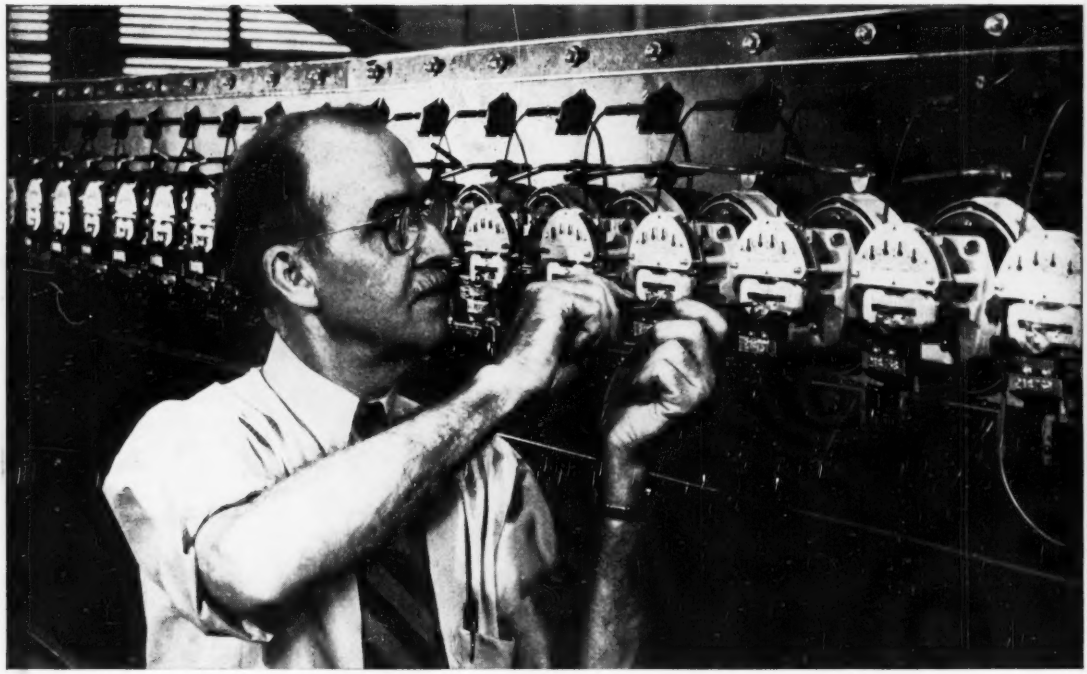
CRESCENT TOOLS

Sign of the Artisan
Symbol of Excellence

"Crescent" is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK

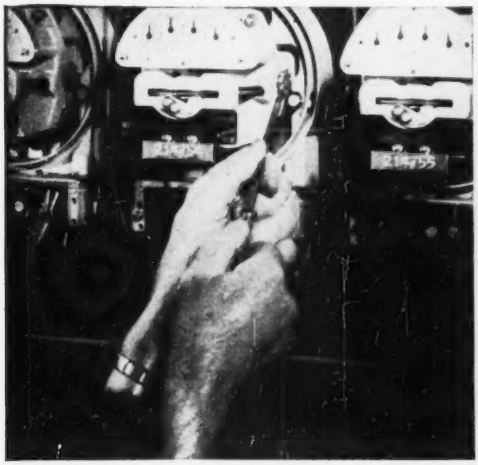
METER TESTERS *Prefer* Sangamo Watthour Meters . . . .



SIMPLE full load and light load adjustments—*readily accessible from the front*, exceptionally clear visibility of disk and its markings, and easy removal of registers—by simply releasing two small locking levers, are a few of the reasons why Sangamo J Watthour Meters are favorites with utility company meter testers everywhere. Faster meter testing, resulting from these advantages, saves man-hours—either in automatic group testing or in individual testing. Further, Sangamo J Meters as received, seldom need any calibration to meet all generally accepted standards of accuracy.

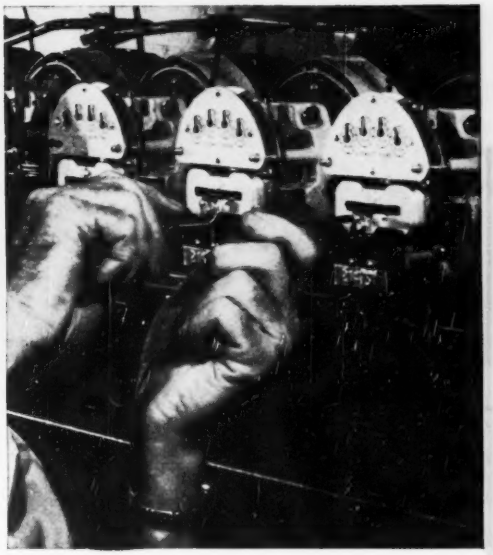
50TH ANNIVERSARY SANGAMO 1899 - 1949

. . . *Faster* TO TEST -- *Easier* TO CALIBRATE!



Making Light Load Adjustment

It's positive—no backlash—and just as easy as it looks. Place screwdriver in slot, move slightly, and "it's right on the button."



Making Full Load Adjustment

Easily and quickly adjusted with ample range for any normal service calibration, the micrometer full load adjustment—a simple steel screw—is accessible with an ordinary screwdriver from the front. Movement of the magnet assembly provides additional range of adjustment if required after replacement of major parts.

Sangamo J Meters have proved their ability to meet the requirements of today and the anticipated loads of the future with sustained accuracy, economy of maintenance and troublefree performance.

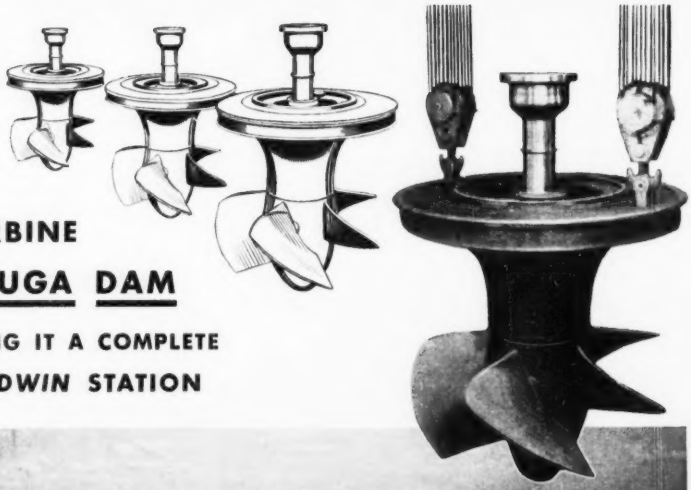
SM497

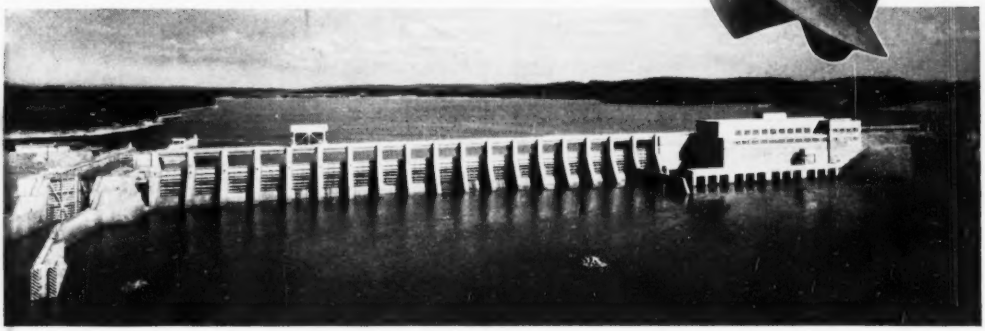
SANGAMO
ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

COMING....

THE FOURTH TURBINE FOR CHICKAMAUGA DAM

MAKING IT A COMPLETE *BALDWIN* STATION





A 33⅓% increase in capacity will be effected at Chickamauga Dam next year, when a new Baldwin turbine, now on order, is installed. This will complete the installation contemplated in the original design; the first three Baldwin turbines having been installed in 1937.

The new turbine is the adjustable-blade type, and will deliver 42,000 hp. at 75 rpm. under a normal head of 48 feet. It is designed to develop at least 20,000 hp. under a 25-foot head, and 36,000 hp. with a 36-foot head. This maximum utilization of reduced heads is of course possible because of the automatic positioning of the blades to suit each condition. Runner diameter is 22 feet, and total assembled weight is approximately 800 tons. When operating at full load, the turbine will discharge up to 8,750 cubic feet of water per second

A total of twenty-seven Baldwin turbines have been built, or are on order, for various TVA projects. Types include Francis, fixed-blade propeller, and adjustable blade propeller types, in capacities from 30,000 to 53,000 hp. Baldwin's broad experience is available to you, in working out details on any development you have in prospect.

BLW THE BALDWIN GROUP **BALDWIN**

HYDRAULIC TURBINES

THE BALDWIN LOCOMOTIVE WORKS
Philadelphia 42, Pa.

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2929 Nineteenth Street, San Francisco 10, Calif.

The Baldwin Locomotive Works, Philadelphia 42, Pa., U. S. A. Offices: Boston, New York, Philadelphia, Houston, St. Louis, Chicago, Cleveland, Pittsburgh, San Francisco, Seattle, Washington. In Canada: Baldwin Locomotive Works of Canada, Ltd., Toronto, Ontario.

Conductor Guards*

Twist on...Twist off...by hand

Easily, Quickly and at Low Cost

Here, the lineman is holding the two strips apart for clearer inspection. In actual application, a motion like "wringing a cloth" is used.

CONDUCTOR GUARDS are simply strips of plastic preformed with such a pitch that when twisted together, they form a tight cylindrical sheath. No special tools are needed to install. The conductor need not be disconnected.

In just a matter of seconds, the lineman wraps the preformed strips around the conductor. The result is a uniform, weather-resistant, tight-gripping guard that gives added insulation and protection against abrasion. Conductor life is prolonged indefinitely.

No other method of conductor protection can be installed so quickly or at such a low cost. For complete details, ask any salesman of American Steel and Wire Company, Locke Incorporated or Line Material Company. Or write directly to us.

*Protected under Patent No. 2,275,019

Where else can you use them?

? APPLICATION

? APPLICATION

? APPLICATION

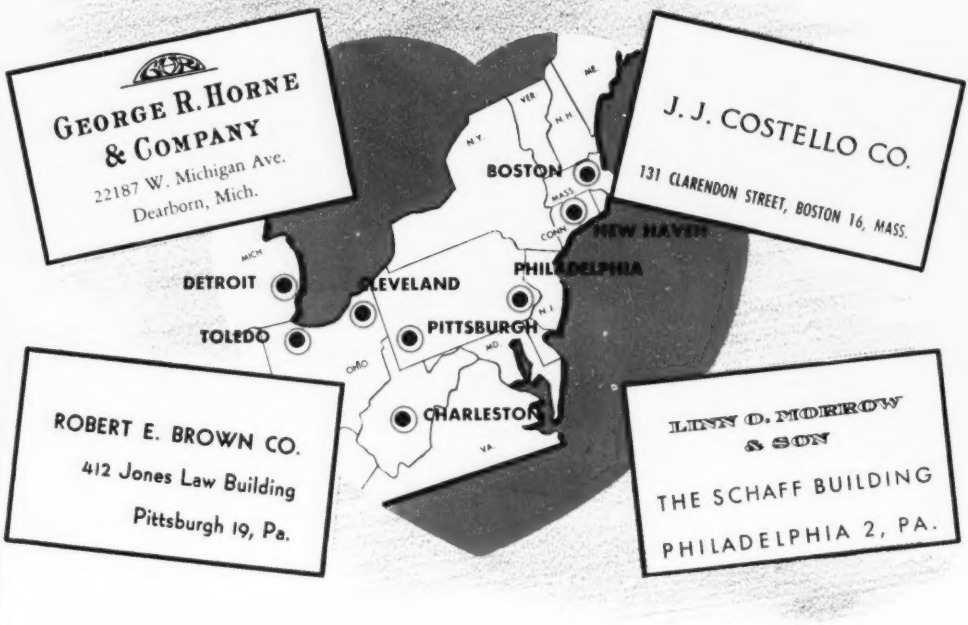
While PLP Conductor Guards were designed primarily for the protection of conductors passing through trees, we visualize many other applications. Conductors passing over other lines could well use these guards. Lines passing too close to buildings are another use. Tell us your need and let us determine whether or not low-cost PLP Guards are the answer.

PLP COMPANY

PREFORMED LINE PRODUCTS COMPANY
1051 POWER AVENUE • CLEVELAND 14, OHIO

SALES "KNOW-HOW"

Today's most important ingredient . . .



Representing 120 years of combined experience selling electrical equipment

J. J. COSTELLO COMPANY
Thirty years of service to the electrical industry in New England representing outstanding manufacturers of electrical products. Sales offices in Boston, Mass., and New Haven, Conn., and adequate warehouse facilities in Boston, Mass. Salesmen cover the six New England States calling on Utilities, Consulting Engineers, Contractors, Industrial Organizations, Wholesalers and Government Agencies. Interested in recognized and accepted manufacturers selling through wholesalers. Efficient office personnel and corrected mailing list for general or specific mailings.

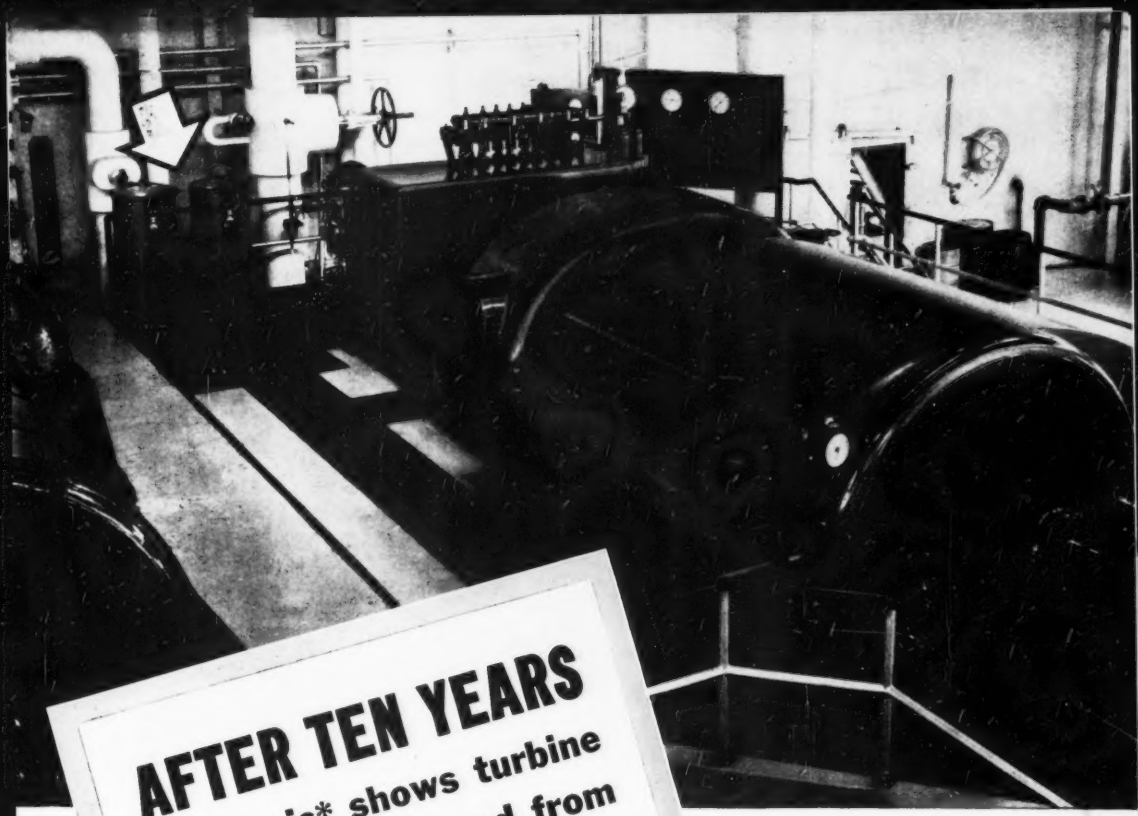
LINN O. MORROW & SON
Operating as a Manufacturer's Agent in the Philadelphia Territory since 1919, covering the eastern part of Pennsylvania, southern part of New Jersey, Delaware, Maryland, Virginia and the District of Columbia. Now Handling Graphic Recording Instruments, Testing Instruments, Lifting and Separation Magnets, Explosion and Weatherproof Equipment. Prepared to sell electrical apparatus noncompetitive with the present accounts.

GEORGE R. HORNE & CO.
. . . . . represents top flight manufacturers of electrical devices and apparatus. Salesmen cover all central and lower Michigan — representative in Toledo, Ohio, covers area including Toledo and Fort Wayne, Indiana. 30 years sales engineering experience selling consulting engineers, utilities, and industrial accounts. Complete mailing lists and facilities for direct mail advertising available.

ROBERT E. BROWN CO.
In business 22 years in the Tri-State District. Main Office in Pittsburgh; Branch Offices in Cleveland, Ohio and Charleston, West Virginia. Contacts continually being made with industrial plants, electric utilities consulting engineers, electrical wholesalers and contractors. Mailing lists constantly revised and corrected, and arranged for general or specific mailings

● *Covering the Heart of Electrical Industrial America*

WE SOLICIT YOUR INTEREST IN OUR ABILITY TO DO A SALES JOB FOR YOU



AFTER TEN YEARS

analysis* shows turbine oil . . . "unchanged from condition when new."

Two Honan-Crane "M" Type Purifiers (arrow) serve one 7,500 kw GE steam turbine and one 5,000 kw turbine at Logansport, Ind., municipal power plant. Each turbine has capacity of 250 gallons turbine oil; purifiers are operated only 8 to 10 hours out of 24.

Honan-Crane Purifiers protect $300,000 investment at Logansport, Indiana

"Installation of Honan-Crane Purifiers was planned as *good insurance* for our new $300,000, 7,500 kw turbine back in 1939", says Robert E. Price, Superintendent of Utilities, Logansport, Indiana.

Good protection pays off! Analyses of Logansport turbine oil made by Socony-Vacuum ten years later (June, 1949) report: "These analyses indicate that except for slight darkening of color, the batches of oil are unchanged from their condition when new. It can be anticipated that they will give many thousands of hours additional service under normal turbine operating conditions."

The experience of Logansport (city of 25,000 population) is duplicated in power plants using Honan-Crane equipment to protect systems of all sizes and capacities serving many of America's largest cities. Using Cranite (specially processed fullers earth), Honan-Crane purification equipment removes contaminants as rapidly as they appear . . . assuring maximum turbine operating efficiency and extending the useful life of the oil.

***Details of Analysis Made by Socony-Vacuum, June 2, 1949:**

(Gargoyl DTE Oil Lt.)

SUS @ 100°	152
SUS @ 210°	42.9
Grav.	29.7
Color	Dark 2
Appearance	Clear
Neut. No.	.05
Steam Emuls. No.	60
Sediment	0

For complete information on turbine oil purification and Honan-Crane oil purifiers . . . write to 819 Wabash Avenue, Lebanon, Indiana.

CLEAN OIL ENGINEERING

HONAN-CRANE CORPORATION, Lebanon, Indiana
A Subsidiary of **HOUDAILLE-HERSHEY CORPORATION**

Here's why

BURNDY HYDENT CONNECTORS

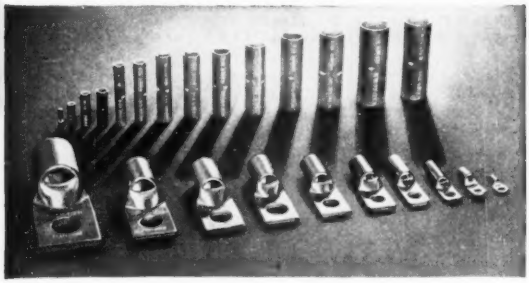
are superior mechanically... electrically

No art tricks . . . this is a cross section photo of a typical HYDENT connection.

Note how the conductor and connector have been compressed into an almost solid mass under high pressure by the Burndy HYPRESS or HYTOOL.

And there's no trick to cutting costs the modern HYDENT way. Just insert conductor, indent with the HYTOOL, and, *presto*, the job is done.

HYDENT connectors are available in all types for conductors #22 through 2000 Mcm . . . all one-piece, pure copper construction, heavily tin-plated. Catalog Y46 gives the complete story. Send for your copy today.



Hydent Connectors range from the smallest sizes used for control, instrument and electronic equipment wiring to the largest cable sizes required in industrial and utility power applications.

Burndy Hytools and Hypresses indent Hydent connectors onto all conductors from #22 to 2000 Mcm.

Hytool — Y9M

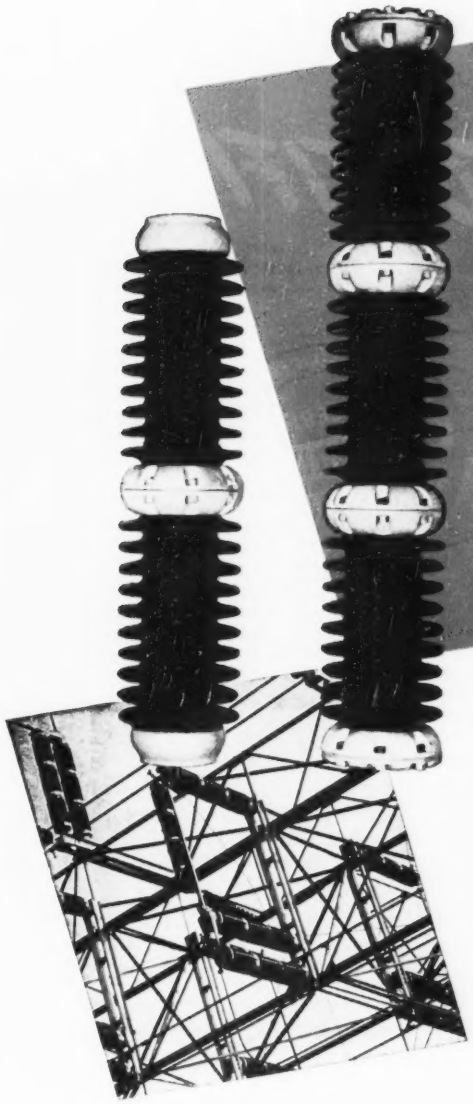
Hypress — Y34-A

Connect with

BURNDY

New York 54, N. Y.

WESTERN BRANCH: Vernon 11, California • CANADA: Canadian Line Materials, Ltd., Toronto 13



Mechanical Security
Electrical Security
Long Life . . .

AT VOLTAGES UP TO 161 Kv

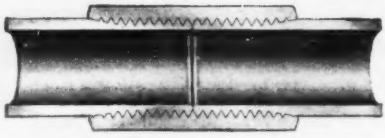
LAPP STATION POSTS

● *It's a matter of record!* The facts-and-figures on 17 years of service of Lapp Post insulators prove that lines and stations on this design have fewer outages, lower maintenance, better performance than lines and stations on any other insulators. It's a difference in engineering concept, a difference in construction—a difference that certainly justifies, for service at all voltages up to 161 Kv, the specification "Lapp Station Posts."

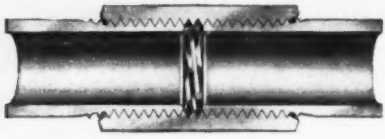
Lapp **STATION POSTS**

LAPP INSULATOR CO., INC. • LE ROY, N.Y., U. S. A.

SHERARDUCT GIVES WIRING



SHERARDUCT COUPLING—All surfaces and threads are Sherardized. Accurately undercut threads permit completely closed joints—no raw threads exposed—no gaps to interfere with the easy fishing of wires.



ORDINARY COUPLING—Raw threads meet raw threads—accelerates rust—weakens joint. Threads exposed in gaps trap wire ends and make the fishing of wires difficult.

- It's the Sherardizing process that *fortifies* SHERARDUCT against rust and corrosion. This process drives a pure zinc dust coating into the steel surface —alloys the coating to the steel wall.
- Still further protection is provided by the baked-on Shera-Solution coating that *seals* the zinc—fortifies SHERARDUCT against acids and other corrosive agents.
- Smooth inside surface makes fishing easy.
- SHERARDUCT is a full weight, threaded, rigid steel conduit.
- *It's fortified for life-time protection!*

National Electric
PRODUCTS CORPORATION

1305 CHAMBER OF COMMERCE BLDG., PITTSBURGH 19, PA.

NATIONAL ELECTRIC PRODUCTS
NE
WIRING SYSTEMS
WIRES AND CABLES

Co-ops' Growing Pains

LIKE THE SMALL BOY who remained one until nature suddenly decided to give him the frame and shape of a man, cooperative electric systems have suffered from severe growing pains since the war. Farmers and other rural dwellers who had possessed their souls in enforced patience through the war years clamored for immediate connection to service lines. Consumers all at once found that they could buy the electrical appliances and devices for which they had the money ready. Load came on the systems like gravel pouring from the tilt body of a truck.

As originally built, most cooperative systems were woefully inadequate for the requirements they soon would have to meet. The informed engineer thinks back to the first years of the cooperatives and remembers the pressure on line designers to cut costs in every possible way. He recalls the kind of thinking in REA from which resulted the 600-w distribution transformer of shameful memory. Co-op systems were sore afflicted by the shortages of labor, materials, and equipment of the war years and immediately after. The effect of the shortages was compounded by the increasing prosperity of farmers, who, having the money to pay for it, demanded more and better electric service in increasing numbers. As a result, co-op system managers have been confronted all at once by practically all the problems that in a normally growing electricity supply system would arise more or less in turn over a comfortable period of time and could be dealt with as they occurred.

In this issue is presented an imaginary conversation among six co-op managers. The conversation is imaginary, but the matters disclosed in it are the participants' own statements. Introducing the dialogue, ELECTRICAL WORLD expressly disclaims any intention of saying or implying there that the problems discussed are representative of all co-op systems or even typical of any number of them. Thus to say or to imply would be contrary to EW policy, which is to keep editorial opinion out of the articles it publishes. But here in this editorial we can, and we do, say we think the difficulties the six managers talk about are common to many co-op systems. More, we think that in these problems lie the real reasons for such deficiencies of service as co-ops now labor under.

This opinion is directly contrary to the idea diligently propagated up and down the land by the REA administrator and others. They cry, "Power shortage" and claim that all co-op troubles stem from inability or unwillingness of the power companies to supply enough electricity to fill the co-ops' needs. There have been such cases, but we know of few. And we'd be willing to bet that examination of all the facts would show them to be nearly as rare as confessed capitalist in Russia.

Growing pains, not power shortage, are what is the matter with cooperative systems today. And, taking as evidence what the six managers say in this issue, we'd say the situation was being brought pretty well under control in co-ops where men equal to them in ability and competence are running things.

Availability

ALMOST EVERY advance in technology aimed at bettered economic performance means a temporary sacrifice in availability of the equipment and, therefore, some early loss offsetting the gains. This is especially to be expected in the early period of pioneering while the "kinks are being ironed out." Most new power plants, in particular, reflect this experience because practically every one involves some degree of innovation even if only in refinement of controls. It is a very fortunate thing if a new turbo-alternator can be started, put on the line, and kept functioning without a shutdown after a short run to rectify something or other. That is no discredit whatever to those who make and install the equipment and devices because the purchaser often will want a check of all critical points even if the operation is superficially superlative.

It is the later interruptions and outages that count, more especially with units affording relatively large strides in efficiency gain. Unfortunately a plant that is shut down—whether by choice or necessity makes no difference—is not then piling up the savings from superior Btu performance available when it is operating. In fact, it is roughly true that a loss of 1% in availability can often offset the benefits of a corresponding 1% in thermal performance. That is why there occasionaly is reluctance to jump into new techniques with commitments as large as turbo-alternators. That is also why it behooves two groups to tell what they know to counteract this natural reluctance.

Those who venture to buy equipment promising better economic performance should tell the rest of the user industry what evidence or inference prompted them to take the risk of the pioneer—knowing that there could be a period of lost availability. After they have been through the break-in stage they are again obligated to pass their experience on to the skeptics and conservatives. Of course, it goes without saying that the producers of these new tools will, if they are wise, be able to tell their prospects the same convincingly reassuring facts about dependability.

Stanley Stokes and E. H. Krieg in a pending article clinch the issue by asserting that 3.6 days' extra outage in the first or any other year can easily offset the economic benefits from an expected 100 Btu gain in heat rate.

$2,200 for a Draftsman

MORE EMPLOYERS are using the job aptitude testing service available at local public employment offices as a means of cutting costs. This is particularly true of those with costly training programs or high turnover because of inability to get the right persons in the jobs.

One of them is Dravo Corp in Pittsburgh. It had a problem training draftsmen. Only 13 out of 30 trainees lasted the three to four years it took to turn an inexperienced worker into a finished draftsman. The company was spending $2,200 to develop a draftsman.

At the company's request, the Pittsburgh office of the Pennsylvania State Employment Service developed a test, tailor-made, for selecting job-applicants with a potential ability for drafting. The test battery included several paper-and-pencil tests, a peg board measuring hand dexterity, and a rivet-and-washer board measuring finger dexterity.

Since then, the employment office has referred to Dravo applicants who passed their draftsman trainee aptitude test. Nine sent to the plant so far have all proved satisfactory. The company says they are of much higher quality than the men it had been hiring and they appear to be learning quicker. As a result the training period may be shortened.

The draftsman test is one of 225 Specific Aptitude Test Batteries developed by the U. S. Employment Service in cooperation with local employment offices operated by the states. Tests developed for one employer are made available by USES to all employers in any part of the country.

On request, the employment service will let employers give the test themselves at their plant if they give it under certain controlled conditions.

In the electric utility industry, a test has been developed for electrical repairman. Tests are available for nine jobs in electrical equipment manufacturing. Others will be prepared on request.

Other contracting and consulting firms as well as the utilities may find this a useful service. Devices for reducing labor cost and turnover are essential for an industry constantly faced with severe competition.

Does TVA Create Wealth?

DID THE HOODLUM who threw a rock through the plate glass window produce as much or more wealth than he destroyed? This is the apt query in the new booklet, "The TVA Idea," by Dean Russell, published by The Foundation for Economic Education.

In the opening pages of this excellent treatise on the social philosophy of government ownership versus private ownership of the means of production, one finds a vivid presentation of the underlying problem. The question is asked whether the expenditures for TVA did not actually prevent an equal or greater amount of products and services from being created. "We can't see the eggs, hats, shoes, and haircuts that the taxpayer never bought due to the fact that hundreds of millions of dollars were taken from them in taxes . . . " The booklet is filled with these simple examples of the broad social problems facing America today. It is written for the lay person. Technical terms are omitted, and facts are authenticated.

One can immediately imagine many uses. The booklet is easy reading in one sitting, and it is conveniently broken down into 13 individual short articles. With this flexibility, it appears likely to be warmly received.

The Electrical Week

The utilities who have long sought a public information program now have it. Under the direction of Bozell & Jacobs the companies are getting the material necessary to tell the story of private enterprise to their customers . . . The Southwestern Power Administration has announced that after the Interior Appropriations Bill is passed it will offer utilities in its area contracts patterned after that signed two years ago with Texas Power & Light Co. The contract governed disposal of energy from federal power projects . . . At the annual convention of the Rocky Mountain Electrical League, Elmer Lindseth, EEI president, told the delegates that to save the industry they must sell the public on the idea that if business loses its freedom so will the average American citizen . . . And in Washington, Leland Olds has another, but temporary, federal job. He is now assistant to Edward Falck, director of NSRB's Office of Energy and Utilities.

Electric and gas utilities are the only major business group to show estimated gains in capital expenditures for the third and fourth quarters of 1949. According to a survey by the Securities and Exchange Commission and the Department of Commerce, these utilities spent $780 million on new plant and equipment in the April-June period. Third quarter is expected to be up $30 million, and fourth quarter is estimated another $20 million higher. Total 1949 outlays are estimated at $3.1 billion —up 16%.

More hydroelectric projects—and sooner—for the West. That's one of the regionally popular issues on which the Democrats tried to build up the party at last week-end's pow-wow in San Francisco. Preparing for the 1950 elections, Truman Cabinet members and local political chieftains sought to unite Western farmer-labor votes behind a program of more dams, the Brannan farm plan, repeal of the Taft-Hartley Act.

When the coal mines closed, the immediate result was a loss of load for the utilities serving them. The Pa.-N. J. interconnection, serving the anthracite mines, lost 110,000 kw. West Penn Power Co officials estimated their company's loss at 70,000 kw. West Penn serves bituminous mines in the Pittsburgh area.

This may or may not be good news to utilities and electrical manufacturers. If you have a suit in the federal courts, you con look for its settlement in less time than in past years. Congress has authorized the appointment of 21 new district judges and six appellate justices, raising the totals to 212 and 59 respectively.

Union labor's resistance to job evaluation systems is fading as it becomes tougher to get across-the-board wage boosts. New study, made by the National Foremen's Institute, Inc, New London, Conn., shows growing sentiment favoring semi-scientific studies of jobs' values. Trend is based on fact that job evaluations bring at least some small wage increases and occasionally a big boost.

Big push for revival of the Passamaquoddy tidal power development will get under way next year. The International Joint Commission, now studying costs and feasibility of a possible engineering survey, will not report until January. Maine's Congressional delegation is ready to start thumping the tub for Quoddy thereafter.

The Los Angeles Board of Public Works is considering setting up a short-wave radio communication system for its garbage trucks.

Television sets may or may not be counted in the 1950 census, but radio sets will. An attempt is being made, however, to put a television question on the census questionnaire.

Ontario Hydro-Electric Commission claims that the largest concrete mixing plant in Canada is located at its Des Joachims project. It mixes 160 cu yd an hour.

Notes From The News

Cooperative promotional efforts of four Commonwealth Edison System members brought 548 new industries and branch plants to Chicago and northern Illinois since the end of the war, Britton I. Budd, president, Public Service Co of Northern Illinois, told a recent conference of system executives. These plants will employ about 60,000 persons and add about $6 million a year to the revenues of the sponsoring utilities . . . Dallas Power & Light Co will get approximately $11,400 from the City of Dallas for the 520-by-2,000-ft strip of Mountain Creek Lake the city needs to extend the Hensley Field jet plane runway.

Engineers working on the Bureau of Reclamation's Hungry Horse Dam in Montana have finally decided it will be the third highest concrete dam in the world.

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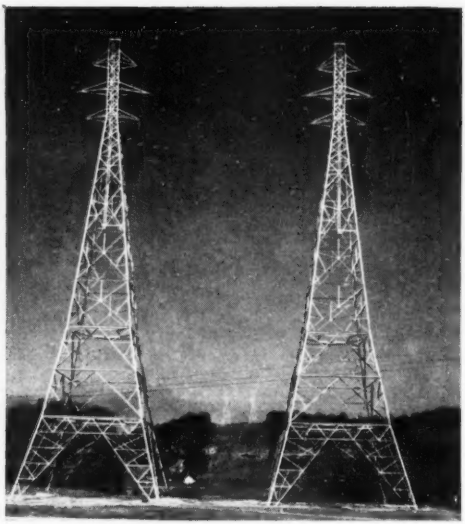


TRANSMISSION TOWERS which will carry the 132-kv circuits from the Philip Sporn Plant of Ohio Power and Appalachian Electric Power Co are shown from the West Virginia side of the Ohio River. Towers are 240 ft high and 197 ft to lowest crossarm. Conductors are ACSR, capable of carrying 125,000 and 140,000 kw per circuit, respectively. First Sporn unit is to go on line next month

Hoover and Shasta are higher than the 564 ft now set as the official height of the arch-gravity dam when it is completed in 1953 . . . As a result of the recent East Coast hurricane Jacksonville, Fla., had to replace 1,494 street lamps, a fourth of the total number it uses. Nearly 12 miles of overhead wire also had to be replaced . . .

Financial:

Stockholders of Beauharnois Light, Heat & Power Co have increased the amount they are asking Quebec Hydro Electric Commission for expropriation of the company from $45,824,496 to $63,927,719. Counsel for the Commission indicated he would contest the amendment, which would add about $11 million for "going value." . . . Iowa Electric Co, Cedar Rapids, has asked FPC permission to issue $1,250,000 in 3⅜% first mortage bonds, Series B, to be dated Sept 1, 1949, and to mature Sept 1, 1974. Purchaser would be Massachusetts Mutual Life Insurance Co . . . Stockholders of Western Electric Co will have a special meeting Sept 27 to consider a proposal to increase the company's authorized capital stock from 9 million to 10.5 million shares. Proceeds from the issue, which would be offered pro rata to stockholders, would be used for repayment of outstanding indebtedness.

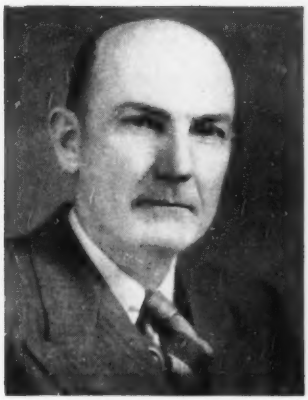
Gulf States Utilities Co has been given FPC permission to borrow $1,433,163.65 on unsecured notes, to mature within nine months, as part of a loan agreement with the Irving Trust Co and the Chase National Bank of the City of New York. A total of $7 million will be borrowed before next June 15 . . . Indianapolis Power & Light Co plans to refund $40 million of its first mortgage bonds to get a lower interest rate and save cash for its construction program. In a petition filed with the Public Service Commission the utility said it would sell at competitive bidding bonds bearing no more than 2⅞% interest, replacing issues carrying 3¼% and 3⅝% interest. The refinancing would cut about $28,000 a year from the utility's interest payments . . . FPC has okayed a Sierra Pacific Power Co issue of $1.7 million in unsecured promissory notes to mature not later than one year from the date of issuance or renewal.

Refinancing of $20,300,000 of Loup River Public Power District and Platte Valley Public Power and Irrigation District bonds has made it possible for Nebraska to expand its public power facilities. A new Federal Works Administration "open end" indenture removed the former specification forbidding issue of additional bonds until outstanding bonds had been redeemed. Part of the proposed construction will be transmission lines to tap the power that will be generated at the Fort Randall Dam in South Dakota . . . El Paso (Tex.) Electric Co has received Federal Power Commission authorization to issue $2.5 million in 3⅛% debentures, to mature Sept 1, 1969. Proceeds of the issue, to be sold to John Hancock Mutual Life Insurance Co, will be used to repay a short-term bank loan of $1,465,000 and to help finance construction . . . Maine Public Service Co plans to raise $900,000 through sale of $600,000 in preferred and $300,000 in common stock this year. A special stockholders' meeting has been called for Oct 13 to approve a charter amendment.

Manufacturers and Markets:

Business has picked up in consumer goods lines throughout the country and this is "going to have a reflection in increased employment," said Charles E. Wilson, president of General Electric Co. "The whole business picture has improved," he added, "and more improvement is on the way." GE has started rehiring at its refrigerator plant at Erie, Pa., a "substantial number" of the 4,000 workers who were laid off last May . . . Immediate price reductions ranging from $4 to $12 on 13 models of electric water heaters were announced this week by Westinghouse . . . August television receiver sales in the Los Angeles area again cracked all monthly records when 18,188 sets were placed in service, boosting total installations to 186,777 and inching Los Angeles toward third place standing in the nation . . . British Ministry of Supply has temporarily suspended sales of copper, lead, zinc, tin, and aluminum from midnight Sept 17. Sales were to be resumed later this week at new prices to be announced by the Ministry.

JAMES W. PARKER
Steering Committee Chairman



J. B. THOMAS
Acting Steering Committee Chairman

P. H. POWERS
Program Chairman Chicago Meeting

PIP Aids Utilities to Tell Their Story

Long Sought Public Information Program Supplies Material to Companies to Show Advantages of Private Enterprise; Bozell & Jacobs Supervises

PUBLIC INFORMATION Program—These three words mean much to many of the nation's investor-owned electric companies. They mean a goal, sought for many years, attained. They mean a way to tell their story—the story of private enterprise—to the people of their service areas.

The Program is comparatively new. It was organized only last February. But the idea of the Program was debated by the members and directors of Edison Electric Institute for nearly a year and a half. Then the idea was abandoned, only to be picked up and developed into an effective organization by 10 electric companies. During the recent summer months the number of participating companies more than quadrupled.

Originally the idea was to have such a program directed and run by the Institute. In 1947 EEI first set up a temporary committee to study the proposal. Later a permanent committee was appointed. Last January EEI directors voted down the proposal. There were three important objections:

1. Many members felt that EEI should remain a statistical organization. Today EEI is just that, but all of PIP's factual information is checked with it.

2. The burden of such an information program would have made it imperative for EEI to increase its dues. Some members objected to the increased expense.

3. There were some members who opposed the setting up of a national program.

When EEI directors vetoed the idea of a public information program, the companies favoring the idea immediately determined to have their own. They turned to Bozell & Jacobs, a public relations counseling firm, for its direction and supervision. This firm had made an enviable record in the work it had performed for electric companies, especially in the Pacific Northwest.

The public relations counsel makes no contact with local information media nor does it otherwise encroach on public relations activities of operating companies. This is in line with the thinking of a large segment of the industry and presented a year ago by ELECTRICAL WORLD (Sept 25, 1948 p 75). At that time, EW called upon individual electric utilities to appoint an executive of high rank (a vice-president) to handle publicity problems national in scope. EW has believed that the problem of influencing the public must be solved by the individual utilities presenting the facts to their customers.

PIP helps the companies to meet local problems by conducting regional meetings in various sections of the country. Yesterday (Sept 23) representatives of the various companies supporting the Program, along with those of many nonparticipating companies, met in Chicago to hear a progress report. It was the fifth such meeting.

P. H. Powers, president of West Penn Power Co, was program chairman. The entire Program is controlled by a committee headed by James W. Parker, president of Detroit Edison Co. This steering committee has been headed during the vacation months by J. B. Thomas, president of Texas Electric Service Co.

Other committee members are W. J. Amoss, New Orleans Public Service Inc; G. M. Gadsby, Utah Power & Light Co; J. E. Loiseau, Public Service Co of Colorado; Grover C. Neff, Wisconsin Power & Light Co; R. H. Knowlton, Connecticut Light & Power Co; K. M. Robinson, Washington Water Power Co; and A. C. Spurr, Monongahela Power Co.

The regional sessions are a common meeting place for all participating companies in that area and also for other companies that wish to sit in. Attendance is small enough to permit all present to participate in the discussion.

The program at Chicago included:

Restatement of objectives of the program and progress to date.

Report of progress in achieving coordination among industry organizations.

Report of progress on formulation of statement of industry policy.

Report of new findings by survey agency on public attitudes.

Report on results and recommendations by public relations counsel (Bozell & Jacobs).

Report on regional activities.

Discussion.

The last item on the program is most important. Here the member companies make known their wishes for future program objectives and criticize what has been done in the past.

The Information Program is both diverse and extensive. For instance, the average monthly output consists of a news story, editorial, shorts, and cartoon for employee publications, other employee information material including a series of pamphlets, pertinent reprints, an analysis of a functioning or proposed federal power project, stockholder information material, such cartoons as are provided to newspapers, speech suggestions, factual background material, briefs on major litigation affecting the industry, news story suggestions as justified, a digest of radio comments about the industry during the preceding month, and bulletins summarizing activities of the period.

But this material has no value if it remains in the companies' files. Here Bozell & Jacobs again steps into the picture. It suggests to the members ways in which the material can be most efficiently handled. Much progress has been made in this direction by a number of utilities. One company, as a case in point, has designated a "digester" to receive all material and to pass on to the proper action source all information which affects it.

Central Surveys, Inc., of Shenandoah, Iowa, and New York, has been retained as a fact-finding agency to assist in establishing themes for the program and to check on its effectiveness at the "grass roots" level. Representatives of the 11 U. S. offices of Bozell & Jacobs are available to the participating companies for counsel in connection with the program.

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Western Berlin to Build $13 Million Power Plant

A new power plant will be built in the Western Occupation Zones of Berlin to make them independent of the Soviet Zone. Economic Cooperation Administration has released $13 million in counterpart funds to finance the project.

This is the first time ECA has approved in western Germany a major use of the counterpart funds in local currency which Marshall Plan nations are required to maintain. The proposed plant is designed to free western Berlin from the threat of such an emergency as resulted when the Russians cut off power supply during their blockade.

SPA Will Offer Utilities Contract Modeled on Texas P&L Agreement

A PROPOSAL "patterned after the Texas contract" will be submitted to electric utility companies by the Southwestern Power Administration after the long-delayed Interior Department Appropriations Bill finally becomes law.

SPA officials say a contract covering wheeling arrangements with power companies in the Southwest has been drawn up but will not be submitted until the Interior bill is enacted. SPA's proposed Texas-type contracts were the center of stormy Senate debate last month when SPA was voted funds to build transmission lines.

Talks Held Sept. 23

Exploratory talks between SPA Administrator Douglas G. Wright and representatives of the utilities were held Sept 23 in Tulsa.

The Texas contract was signed in April, 1947, by SPA and the Texas Power & Light Co. It provides for sale to TP&L of energy generated at the Government's Denison Dam. SPA can draw energy from TP&L's system up to a maximum of 70% of the Denison power delivered to the company for supplying energy to SPA "preference" customers. The company, under certain conditions, also agreed to build substations, lines, and other transmission facilities to serve SPA customers. A vital proviso—in the eyes of the companies—prevents SPA from serving communities already served by TP&L.

Letters Read in Debate

This contract, which set a pattern for industry-government cooperation in power distribution, was spotlighted in the Senate on Aug 23 when an exchange of letters was introduced into the Interior bill debate. The letters were written to Sen Carl Hayden, Arizona Democrat.

In the letters:

1. R. K. Lane, president of the Public Service Co of Oklahoma and spokesman for 11 Southwestern companies, denied that company contract proposals had differed greatly from the Texas contract. The companies, Lane declared, "stand ready and willing to execute agreements containing the identical provisions of the Texas Power & Light Co contract with the Southwestern Power Administration."

2. SPA Administrator Wright outlined seven principles for the Southwestern contract, with compensating amounts of power and energy in accord with the Texas contract as one of his points.

3. Mr Lane attacked the Wright letter as "a complete evasion and avoidance of the terms and provisions" of the Texas contract.

New SPA contract proposals, readied for future negotiations, will be based on the Texas agreement, but provisions will not be identical. SPA officials point out that the Texas contract covered only one situation, and they feel it is "no panacea."

How closely the new contract follows the Texas "pattern" may be the issue in future negotiations at Tulsa.

•

Scrap Over Power Funds Nears End in Congress

Members of the House of Representatives came back to Washington this week from their prolonged Labor Day recess, and this year's long scrap over power and power-related federal funds is on the home stretch.

Both the controversial Interior Appropriation Bill and the Department of the Army civil functions measure with funds for the Corps of Engineers have passed both houses of Congress. But the figures didn't tally, and conferences between Senators and Representatives must still be held to settle on the final figures.

At stake in the Interior conference will be three projects of the Bureau of Reclamation which were approved by the House and deleted by the Senate. These include $2 million for the Bureau's proposed Delta steam plant in the Central Valley of California, $1,655,000 for Central Valley transmission facilities, and $108,000 for a Colorado transmission line. Ironically for the Bureau, the Senate, which made these cuts came up with some $59 million more than the House for the Department as a whole.

The Senate also added $158,148,420, largely in rivers and harbors and flood construction funds, to the amount the House approved for the Corps of Engineers. That difference will have to be ironed out in conference.

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Florida Franchise Voted

Oakland Park, Fla., City Commission has voted a new 30-year power franchise for Florida Power & Light Co.

SESSION devoted to sales problems at annual convention of Rocky Mountain Electrical League was addressed by G. H. Smith, left, Deepfreeze Division, Motor Products Corp; Vernon E. Vining, Westinghouse Electric Corp; and Arthur L. Scaife, General Electric Co. Presiding officer was L. M. Burdick, right, General Electric Supply Corp

Lindseth Advises Appeal to Public Be Based on Threat to Its Freedom

SAVING A BUSINESS—any business—from nationalization helps preserve freedom for every American citizen—and the electric utility industry must accept and practice this philosophy before it can fight government encroachment successfully. This was the theme of the address given by E. L. Lindseth, Edison Electric Institute president, at the 46th annual convention of the Rocky Mountain Electrical League held at Estes Park, Colo., Sept 11 to 14.

No group can get public support to save "our" business because "we" are being hurt or unfairly treated, Lindseth said. Rather, he pointed out, it is necessary to show the average citizen that his own freedom is being sacrificed when another's business or job is nationalized. Only when he is shown that it is his savings and the future savings of his children that are being taxed away will he be on "our" side—which is really "his" side—in the fight for a free America.

Lindseth outlined eight things that anyone anywhere can do to help stem the tide of federalization of business and other encroachments on freedom: Resolve that something can be done; become informed; recognize that many proposals for reform spring from real problems; be for the right things, not just against the wrong things; develop a convincing story in simple terms; see that the story is told; actively participate in government; and, most important, deserve the people's confidence.

Discussing the growth of big government, the threat of Socialism and Communism, and the drift toward statism, J. L. Singleton, Allis-Chalmers Manufacturing Co, recommended hard-headed analysis of the situation, clarification of fundamental thinking about the proper role of government, and action rather than passive submission.

George C. Tenney, editor of *Electrical West*, warned against overwhelming the public with facts and figures, as in previous efforts to win its support. A grass-roots approach telling the story in the simplest possible, easily remembered language, he said, will gain the solid block of understanding friends so badly needed.

Should the electric power industry become government-managed, no private industry would be free to decide where to locate its facilities, what to produce, or how many to employ, J. E. Corette Jr, vice-president, Montana Power Co, declared. The heavy taxation required to support such government operation, he pointed out, would discourage expansion of business, big and small, and make it difficult for the individual to save money or even carry adequate insurance—leading to a decreasing standard of living for every person in the United States.

Willing discharge of discretionary obligations by the electric utility—obligations above and beyond that of simply supplying good service at a fair price—was urged by J. E. Loiseau, president, Public Service Co of Colorado. To make the utility a good citizen and worthy of public support, he suggested encouraging employees to take part in civic affairs, reasonable cooperation with publicly as well as privately owned utilities, and, most important, keeping the public informed of the facts of regulation, taxation, and other factors indirectly affecting it.

Development and training of an intelligent, aggressive sales force is the most critical problem facing the electrical appliance industry today, G. H. Smith, Deepfreeze Division, Motor Products Corp; Art Scaife, General Electric Co; and V. E. Vining, Westinghouse Electric Corp, agreed. Competent manpower is just as available as it has ever been, they said—the need is for a change in attitude and methods of those responsible for sales training.

W. D. Johnston, vice-president, director, and Wyoming Division manager of Mountain States Power Co, was elected president of the League, succeeding H. T. Rankin, Public Service Co of Colorado.

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Committee Sets Limits in Rural Phone Measure

More restrictions on proposed REA loans for rural telephones have been added in a Senate committee, but time is now against passage of the bill this session.

Amendments by the Agriculture and Forestry Committee to the House-approved measure take public bodies off the preferred list of potential REA-financed farm phone operators and strengthen rules against duplication of existing telephone facilities. Loans for rural phones in states which have no telephone regulatory body would be made only with the written finding of the REA Administrator that no duplication of lines was threatened, except where existing systems were unable or unwilling to provide service.

REA phone loans could not be made under the amended bill to systems serving more than 1,500 subscribers in rural areas. No loans for consolidation or refinancing would be permitted. Existing phone companies would get a year instead of six months in which to apply for loans before newcomers could make applications. Also added in the bill were new definitions of "rural area" and even "telephone service."

"Rural area," in the amended bill, includes any location aside from cities, villages, or boroughs, incorporated or unincorporated, with a population in excess of 1,500, and, in addition, not within a suburban residential area adjoining such non-rural communities.

Lighting Art Reviewed at Convention of IES

In the past 40 years the use of light in this country has increased 150 times, doubling about every 5 to 6 years, and the use of electricity for lighting has been multiplied 25 times. In these terms Dr Ward Harrison summarized the growth of the lighting art in the period of his identification with it as he received the Illuminating Engineering Society Gold Medal at the annual convention of the society at French Lick this week.

Failure of the older generation to instill in youthful minds appreciation of such accomplishments of business enterprise, he continued, is responsible for much of the twisted thinking, critical of business, now so common among younger folks.

Reviewing the aims and accomplishments of the society during his term, Lee E. Tayler, retiring president, emphasized to the 750 members and guests that the end purpose of lighting technology, as of all other engineering activities, is human benefit. President Charles H. Goddard cited a specific example of such benefit in the "American Standard for School Lighting," a recent accomplishment of the society.

Forum speakers demonstrated how they made Planned Lighting pay. Their talks followed closely the pattern laid down in the Planned Lighting issue of ELECTRICAL WORLD, July 30. A series of technical sessions, composed of some 40 engineering papers and committee reports, covered resources, color, and applications of light.

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UEW to 'Close Ranks,' Fight for $500 Package

The United Electrical Workers, CIO, don't like the steel board's recommendations against a general fourth-round wage increase.

They will "close their ranks" to win demands for a $500-a-year package from the electrical industry to be paid in wage increases, reduced hours, and improved pensions and health and welfare plans.

This was the decision of their fourteenth convention at Cleveland this week. It was made after a ringing denunciation of the industry, the Truman administration, fact-finding, and Philip Murray's steel union by James J. Matles, the union's director of organization and chief negotiator.

What stung Matles particularly was that the steel board (1) criticized the practice of industrywide or "pattern" bargaining and, more important, (2) went out of its way to argue against wage boosts in all major industries, not just steel.

Negotiations with Westinghouse, General Electric, and other major employers in the industry have been at a standstill since early summer. Industry leaders have stood fast against another round of wage increases.

Belittling the steel board's report as a factor in UE's negotiations in the electrical industry, Matles told the 1,000 delegates from 400 local unions that the union already had made "complete or partial settlements," including wage increases and welfare benefits, with more than 300 companies in the industry. Then he asked:

"Do you think we are going to stand in line to give that money back to the employers?"

The union's financial report disclosed assets of $2,507,000 and liabilities of $18,500 on July 31. Receipts for the fiscal year totaled $2,576,291 and expenditures $2,507,398, showing a profit of about $69,000.

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Drop Black River Plant

Black River Development Corp has abandoned plans to construct a $1,627,000 power plant on the Black River at Glen Park, N. Y. The New York Public Service Commission refused to approve the project.

PLANT of the Southeastern Indiana Electric Co at Rushville following the explosion

Cause of Rushville Plant Explosion Still Unknown

Cause of the explosion which wrecked the Rushville Plant of the Southeastern Indiana Power Co on Sept 15 is still unknown. One of the diesel engines (the plant has four) exploded. The top went through the roof, which then fell in and brought two walls down with it. Two men were killed and one injured.

The other three units were immediately shut down. The Rushville municipal system was tied in within a few hours. Public Service Co of Indiana also began feeding in from Shelbyville and Greensburg, 20 miles south and east, and took over the bulk of Southeastern's load. Some 12 hours later most of the customers were receiving service.

The preceding week Public Service had agreed to take over the Southeastern system. This deal is awaiting approval of the Indiana Public Service Commission.

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Kennecott Copper Elects

Carl T. Ulrich, vice-president and treasurer of Kennecott Copper Corp, has been elected chief executive officer until a successor to Pres E. T. Stannard has been named. Stannard was killed in an air crash that also took the lives of Vice-Pres R. J. Parker and Arthur D. Storke, president-designate.

Leland Olds Gets Another U. S. Job As Senate Stalls FPC Appointment

While a Senate subcommittee is lining up witnesses to hear next week on his appointment to another term as a Federal Power Commissioner, Leland Olds goes back on the federal payroll in another bureau.

Olds has been given a temporary appointment as a consultant with the National Security Resources Board. He will serve under Edward Falck, director of NSRB's Office of Energy and Utilities.

The appointment, which requires no Congressional approval, emphasizes Olds' retention of strong Truman Administration support. This support first became evident when Olds was reappointed despite reported opposition of some Democratic leaders in Congress. More important, it indicates that the Administration will make a real fight in the Senate on the confirmation issue, with an interim appointment a virtual certainty if the Senate takes no conclusive action on Olds.

Meanwhile, a Senate Interstate and Foreign Commerce subcommittee, headed by Sen Lyndon Johnson, Texas Democrat, has invited interested parties to testify at hearings starting Sept 27 on President Truman's appointment of Olds to the FPC. Originally scheduled for last Tuesday, the hearings are the first action the Senate has taken on Olds' nomination, although he was named for a third five-year term on the Commission before his second term ended June 22.

The subcommittee, which is expected to come up with an unfavorable verdict on Olds, will report to the full committee, which, in turn, reports to the Senate. If the nomination does not get to a vote in the Senate this session —a distinct possibility—Mr Truman may put Olds back on the Commission under an interim appointment.

FPC has been operating with only four members since Olds' term expired and has not had any split decisions. But this tranquil situation may be nearing an end. Final briefs are due this weekend on the controversial Roanoke Rapids case involving the application of Virginia Electric & Power Co for license to build a hydroelectric project on the Roanoke River. The Department of the Interior opposes the application. In this situation the Commission may conceivably split on the issue of private vs federal power development, with the decisive fifth seat vacant.

Until the Senate acts on the Olds nomination or Congress adjourns, FPC is faced with potential deadlocks. And the controversial Olds will be on the staff of NSRB.

HOCKEY becomes industry news when the rink is installed in the lobby of the Cincinnati Gas & Electric Co's main office building. Here Norman Chapman, left, and Paul Bibeault of Cincinnati Gardens, which will field a team in this year's U. S. Hockey League, demonstrate playing techniques. The show is all part of a program to promote home freezers

Utilities in Good Shape to Weather Coal Strike

Electric utilities, generally, appeared in better shape to weather the shutdown of the coal mines this week than any other major industry.

An Electrical World study, based on preliminary estimates of the Federal Power Commission and other federal agencies, put the coal stocks held by electric power companies at 1,119,000 tons, as of Sept. 1. Based on estimates of consumption during August, these stocks would be sufficient to carry the industry for 129 days. September fuel consumption probably will be higher than the previous month's. On the other hand, a prolonged mine shutdown eventually would reduce many industrial activities, cutting needs for power.

Informed opinion as to the duration of the coal-mine shutdown ranges from an optimistic "within three weeks" to a gloomy "two month or more." Electric industry observers go along with the optimistic viewpoint. They point out that within three weeks a coal shortage would cramp steel production and other basic industries. It is almost inconceivable that the President would let this go on without exercising federal seizure provisions of the Taft-Hartley Act, these sources maintain.

According to FPC figures, bulk of the coal supplies held by utilities are owned by the larger companies having the best storage facilities. As of Aug 1, companies producing 100,000 kwhr or more held two-thirds of the industry's total stock of 18,649,000 tons. Based on then-valid consumption figures, that was 134 days' supply for the industry, as against the major companies' supply of 137 days.

At the start of the closedown this week the average national coal supply was estimated at approximately 66 days.

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Hydro Projects Okayed

Nantahala Power & Light Co may build four hydroelectric plants on the East Fork of the Tuckasegee River in Jackson County, N. C., without a Federal Power Commission license. FPC has ruled the proposed project will not affect the interests of interstate or foreign commerce nor lands or reservations of the United States. However, FPC said, further development of the watershed of the Little Tennessee River, of which the East Fork of the Tuckasegee is a tributary, may "so change the material facts upon which we based our findings . . ." that reexamination may be required.

McLaughlin Says Price PUD Paid Not Too High

The statement in Washington, D. C., by Rep Ben Jensen, Iowa Republican, that Puget Sound Power & Light Co, Seattle, Wash., sold its Snohomish County properties to the Snohomish PUD at "greatly inflated" values is "unsupported by the facts," says Frank McLaughlin, company president.

A $9.5-million award in condemnation proceedings several years ago was 5.2 times the company's gross earnings in 1942, McLaughlin pointed out. The same ratio applied to 1948 earnings would produce a figure of $17,788,659, whereas the sale price was $16,565,000 plus accounts receivable. The PUD would not have dismissed a recent condemnation action against the property if it had not been convinced the purchase price was a fair one, McLaughlin commented.

A. H. Murray, PUD manager, similarly denied Jensen's charge that the $180,000 commission paid Guy C. Myers as fiscal agent in the transaction was out of line. Myers actually had received only $38,000 of the total and would receive the remainder over the life of the bonds, Murray said.

The company's indicated earnings on the properties were 1.78 times the service charges on the bonds and constructed a much better than average coverage on transactions of the kind, Murray declared.

SEC RULINGS

Standard Gas & Electric Co has been authorized to offer for sale two blocks of stock in subsidiary companies, although only one block is to be sold. Under the proposal, Standard Gas has advertised for sale under competitive bidding 250,000 no par common shares of Louisville Gas & Electric Co and 200,000 $20 par common shares of Oklahoma Gas & Electric Co. No less than four days before opening of bids, Standard Gas will decide which of the two blocks of stock to sell, and will notify all underwriting firms which have indicated that they plan to bid. Standard Gas also plans to stabilize the market price of stock on which bids are to be received, during the two days preceding opening of bids. SEC has reserved jurisdiction to approve terms of sale of either block of stock and imposed a condition, prohibiting any representative of Standard Gas from being a candidate for election to board of directors of the Louisville company at its next stockholders' meeting in May, 1950. (Release No. 9308).

Utah Power & Light Co has received authorization to sell at competitive bidding $3,000,000 of first mortgage bonds due Oct 1, 1979, and 148,155 additional shares of its common stock. The stock is first to be offered to the company's common stockholders on the basis of one new share for each eight held at a price to be determined by competitive bidding by underwriters. Proceeds from the sales will be used for the company's construction program. (Release No. 9309).

Wisconsin Public Service Corp (Milwaukee) has received clearance for the sale of $4 million of a new series of first mortgage bonds, due Sept 1, 1979, subject to the results of competitive bidding. The commission also authorized the simultaneous sales by Wisconsin of 250,000 shares of its unissued common stock ($10) to its parent, Standard Gas & Electric Co. (New York), for $2.5 million. Standard now owns all of the outstanding common stock of Wisconsin. Proceeds of the bond and stock financing will be used by Wisconsin to repay $6 million of short-term bank loans incurred to finance temporarily its construction program. (Release No. 9321).

Iowa Public Service Co's amended plan for merger with and into its parent, Sioux City Gas & Electric Co, both of Sioux City, has been approved as "fair and equitable" to all classes of security holders affected. The remaining three minor public utility subsidiaries of the Sioux City holding company system, Nebraska Public Service Co, South Dakota Public Service Co, and Yankton Gas Co, all of Sioux City, the securities of which are wholly-owned within the Sioux City system, will be liquidated and dissolved and their assets transferred to and their liabilities assumed by Sioux City. Pursuant to the plan, Sioux City will change its name to Iowa Public Service Co. (Release No. 9393).

MEETINGS

National Electronics Conference
Edgewater Beach Hotel, Chicago, Ill., September 26-28.

American Society of Mechanical Engineers
Fall Meeting, Lawrence Hotel, Erie, Pa., September 27-30; Annual Meeting, Hotel Statler, New York, N. Y.; November 27-December 2.

Indiana Electric Association
Annual Convention, French Lick Springs Hotel, French Lick, Ind., September 28-30.

National Television and Electrical Living Show
Second Annual Show, Sponsored by Chicago Electric Association, Chicago Coliseum, October 1-9.

Interstate Power Club of New York
Fall Meeting, Hotel Martinique, New York, N. Y., October 3.

National Association of Corrosion Engineers
South Central Region, Adolphus Hotel, Dallas, Tex., October 3-4.

Edison Electric Institute
Electrical Equipment Committee, Hotel Van Curler, Schenectady, N. Y., October 3-5; Meter and Service Committee, Leland Hotel, Springfield, Ill., October 3-5; Transmission and Distribution Committee, Lord Baltimore Hotel, Baltimore, Md., October 31-November 1; Prime Movers Committee, Sheraton Hotel, Rochester, N. Y., October 10-11.

Association of Iron and Steel Engineers
Annual Convention (without exposition), William Penn Hotel, Pittsburgh, Pa., October 3-6.

Canadian Electrical Manufacturers Association
Annual Meeting, General Brock Hotel, Niagara Falls, Ont., Canada, October 4-6.

Pennsylvania Electric Association
Prime Movers Committee, Hotel Edison, Sunbury, Pa., October 6-7; Transmission and Distribution Committee, Fort Ligonier Hotel, Ligonier, Pa., October 20-21; Relay Committee, Americus Hotel, Allentown, Pa., October 13-14; Systems Operation Committee, Split Rock Lodge, Blakeslee, Pa., October 20-21; Electrical Equipment Committee, Hotel Edison, Sunbury, Pa., October 27-28; Communications Committee, Benjamin Franklin Hotel, Philadelphia, Pa., November 3-4.

Iowa Utilities Association
Management Conference, Hotel Fort Des Moines, Des Moines, Iowa, October 10-11.

American Society for Testing Materials
First Pacific Area National Meeting, Fairmont Hotel, San Francisco, Calif., October 10-14.

American Standards Association
Annual Meeting, Waldorf-Astoria Hotel, New York, October 11-15.

International Association of Electrical Leagues
Annual Conference, Hotel Cleveland, Cleveland, Ohio, October 12-15.

Electrochemical Society
Fall Congress, La Salle Hotel, Chicago, Ill., October 12-15.

American Institute of Electrical Engineers
Midwest General Meeting, Netherland Plaza Hotel, Cincinnati, Ohio, October 17-21.

American Welding Society
Annual Meeting, Hotel Cleveland, Cleveland, Ohio, October 17-21.

Missouri Valley Electric Association
Accounting Conference, Robidoux Hotel, St. Joseph, Mo., October 20-21.

National Safety Council
National Safety Congress and Exposition, Stevens, Congress, Morrison, Sherman Hotels and the Palmer House, Chicago, Ill., October 24-28; Electrical Equipment Section, Stevens Hotel, October 26-27.

National Metal Trades Association
Annual Convention, Palmer House, Chicago, October 26-28.

Southeastern Electric Exchange
Sales Conference, Biltmore Hotel, Atlanta, Ga., October 26-28.

Institute of Radio Engineers-American Institute of Electrical Engineers
Conference on Electronic Instrumentation in Nucleonics and Medicine, Hotel Commodore, New York, October 31-November 2.

National Electrical Contractors Association
Annual Convention, Rice Hotel, Houston, Tex., November 8-11.

National Electrical Manufacturers Association
Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., November 14-18.

Refrigeration Equipment Manufacturers Association
All-Industry Refrigeration and Air Conditioning Exposition, Atlantic City Auditorium, Atlantic City, N. J., November 14-18.

New Jersey Utilities Association
Annual Meeting, Seaview Country Club, Absecon, N. J., November 18-19.

Wisconsin Utilities Association
Joint Annual Convention, Electric and Gas Sections, Schroeder Hotel, Milwaukee, November 21-23.

Exposition of Chemical Industries
Grand Central Palace, New York, N. Y., November 28-December 3.

★ **American Society of Refrigerating Engineers**
Annual Meeting, Edgewater Beach Hotel, Chicago, Ill., December 4-7.

★ **American Society of Agricultural Engineers**
Winter Meeting, Stevens Hotel, Chicago, Ill., December 19-21.

★ **National Farm Electrification Conference**
Stevens Hotel, Chicago, Ill., December 20-22.

★ Additions this week

Output Swings Upward; Percent Change at + 2.8

Making a sharp recovery during the week ended Sept 17, 1949, the output curve moved upward to the highest point recorded since mid-February. The amount of electrical energy distributed by the light and power companies of the country totaled 5,579,105,000 kwhr, the Edison Electric Institute reports, comparing with 5,426,247,000 kwhr during the corresponding week of last year. The percent change advanced to a +2.8, which compares with a +1.8 for the week ended Sept 10.

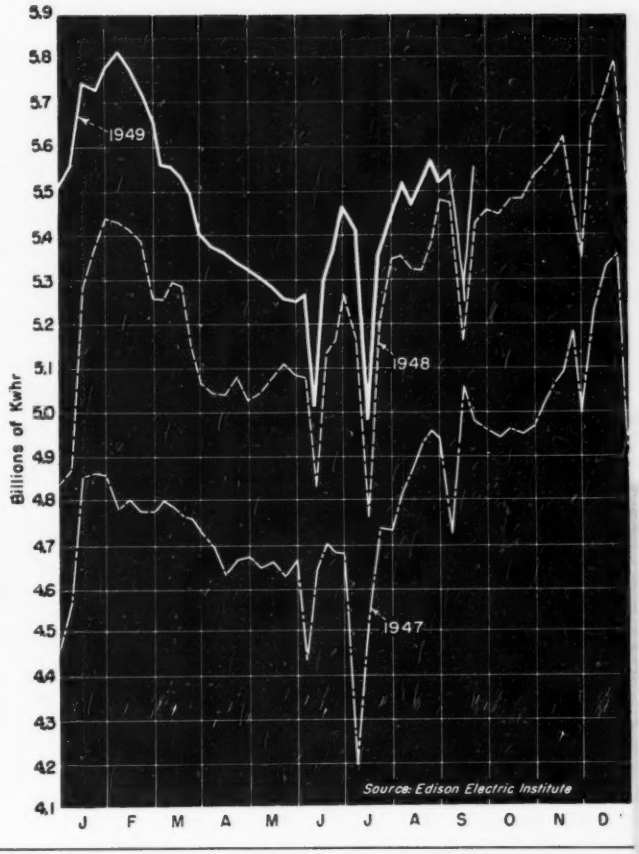
The New England group remained in the plus column with an increase of 3.7%, while the Mid-Atlantic and Central Industrial States both cut the percentage decrease, the former to 1.4 from 3.5 and the latter to 1.6 from 3.6 for the preceding week.

Weekly Output, Millions Kwhr

1949	1948	1947
Sept 17 5,579	Sept 18 5,426	Sept 20 4,977
Sept 10 5,258	Sept 11 5,166	Sept 13 5,053
Sept 3 5,544	Sept 4 5,470	Sept 6 4,721
Aug 27 5,523	Aug 28 5,478	Aug 30 4,940
Aug 20 5,579	Aug 21 5,391	Aug 23 4,953
Aug 13 5,530	Aug 14 5,318	Aug 16 4,923
Aug 6 5,466	Aug 7 5,319	Aug 9 4,874
July 30 5,518	July 31 5,352	Aug. 2 4,806
July 23 5,462	July 24 5,342	July 26 4,730
July 16 5,342	July 17 5,197	July 19 4,732
July 9 4,982	July 10 4,760	July 12 4,531
July 2 5,410	July 3 5,166	July 5 4,190
June 25 5,466	June 26 5,257	June 28 4,675

Percent Change from Previous Year

	Sept 17	Sept 10	Sept 3
New England	+ 3.7	+ 2.1	— 0.5
Mid-Atlantic	— 1.4	— 3.5	— 1.7
Central Industrial	— 1.6	— 3.6	— 3.7
West Central	+ 2.9	+ 3.6	— 1.7
Southeast	+ 5.1	+ 3.4	+ 2.5
South Central	+11.9	+ 8.7	+ 4.9
Rocky Mountain	+ 9.1	+11.6	+13.5
Pacific Coast	+ 7.8	+ 9.2	+ 9.3
Total United States	+ 2.8	+ 1.8	+ 1.4



Second Order Issued to Block Idaho Lines

A second temporary restraining order has been issued to prohibit Idaho Power Co from continuing construction of its Boise-American Falls transmission line over public lands.

Federal Judge Charles C. Cavanah issued the order Sept 17 forbidding work on the disputed lines until he finally decides the government's suit for a permanent injunction against Idaho Power.

The government, suing in behalf of the Interior Department, has charged the company with trespassing on public lands.

Idaho Power is now restrained not only from erecting any further poles but also from entering upon public lands "without the consent of the United States, pending further order of the court."

A temporary restraining order issued by Federal Judge Chase A. Clark was in effect from Aug 6 to Sept 8 when Judge Clark dissolved the restraint and ordered the case brought to trial at an early date. Because of a heavy court calendar, Judge Clark asked that retired Federal Judge Cavanah hear the case.

Judge Cavanah gave each side seven days to file briefs, with an additional five days in which the opposing attorneys could file answering briefs.

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D. of C. Merger Approved

Merger of Braddock Light & Power Co's facilities into those of Potomac Electric Power Co has been authorized by the Federal Power Commission. Braddock, a wholly owned subsidiary of Pepco, serves the Pentagon Building and approximately 2,000 other customers in Arlington County, Va., and furnishes power at wholesale to Virginia Electric & Power Co.

PUC Approves Merger of Edison, Metropolitan

Merger of Edison Light & Power Co, York, Pa., with its parent, Metropolitan Edison Co, Reading, has been authorized by the Pennsylvania Public Utility Commission.

The merger has been pending since Nov 27, 1946. Both are part of the General Public Utilities Corp system. Metropolitan Edison will pay $5,372,570 to acquire its subsidiary's assets. Of the purchase price, $4,545,336 will cancel Metropolitan's investment in Edison, and $827,234 will represent Edison's debts.

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Tax on Utilities Retained

Jacksonville, Fla., City Council has voted to retain its tax on utilities, at least for the present. The decision followed a controversy of several months.

WASHINGTON COMMENT

WILLIAM B. WHICHARD

JOHN L. LEWIS, czar of the nation's coal mines, has done it again. Just as his arch-enemy, Phil Murray, was cornering all the headlines with the threat of a strike by the CIO steelworkers, Lewis' mineworkers decided to stay out of the pits. Unless the miners return soon, it won't make much difference how the steelworkers make out with their contract negotiations. Without coal, they can't make steel.

Fortunately for the electric utilities, there are almost record stocks of coal stockpiled for thermal generating plants. Small systems, including municipals which cannot stock coal for various reasons, may soon be pinched. But, generally, the industry is prepared to weather any but the most protracted stoppage of coal production. Of course, long before electric power company coal stocks run out, a lengthy coal strike will have affected the industry indirectly through the shutdown of other businesses.

Lewis' aides piously point out that their chief sent no strike call to UMW's locals. He simply notified them of his "rhubarb" with Southern coal mine operators who refused to contribute to the miners' welfare and pension fund. The locals did the rest—at least, that's how UMW headquarters tells it.

At any rate, the miners' no-work decision came at a moment when it seriously embarrassed two men for whom Lewis has little love—President Truman and Phil Murray. And Lewis never was one to pass up a chance to bruise two foes with one rock.

With so much of his national and international programs depending upon the good health of the U. S. economy, the President particularly hopes both the miners and the steelworkers will stay on the job. A major strike in either industry can quickly reverse the recent upward trend of production and employment. The damage to U. S. prestige abroad, however, looms as equally important. The Communist bloc of nations long has been predicting that the U. S. was heading for an economic bust in which we would drag our new European allies to ruin with us.

That's why the Administration moved into the steel crisis so hastily. But by this week almost all the Government's resources for maintaining peace in the steel industry through persuasion appeared near exhaustion. Remaining were only the emergency powers granted the President under the Administration-hated Taft-Hartley Act. And it would hurt more than the President's pride to resort to these.

The coal miners' refusal to work, if it appears likely to continue, cannot do other than dampen the enthusiasm of steel management and labor for their own negotiations. Both sides know that any prolonged coal mine shutdown will curtail, eventually stop steel production.

This hurts Phil Murray's chances of calling the steel negotiation terms. All that Murray has in the way of a club is his strike threat. That won't mean much if the steel plants are going to run out of coal anyhow.

TECHNICAL NOTES

ARCHER E. KNOWLTON

Adapted from conclusions in comprehensive paper "The Integrated Power System as the Basic Mechanism for Power Supply" by Philip Sporn, president American Gas & Electric Co, at United Nations Scientific Conference on the Conservation and Utilization of Resources.

Electric energy in adequate and economical supply is one of the elements needed to give a balanced economy to an area or region.

Integrated power system social-economic objective is to furnish an area or region energy of proper quality at lowest practicable cost.

Technical bases behind a properly set up integrated system are (1) Proper location of generating centers, (2) maximum exploitation of the most economical sources of energy supply, (3) ability to exploit inherent savings in the size of units and in amounts of reserve, (4) lowered margins of insurance, (5) lowered cost of meeting emergencies, (6) interconnection so set up that all generating and all load centers are integrated as a unit and operated as a basic whole.

Interconnections with systems outside can be a source of major energy supply, particularly if one system is predominantly steam-electric and the other predominantly hydro-electric.

Transmission should be designed (1) To have the highest practicable voltage, (2) to use a minimum number of subsidiary voltages, (3) to be able to provide full capacity for free flow of power in all parts of the system, (4) to be able to stay together in parallel under all operating conditions, (5) to be able also to handle power reversals with the utmost reliability.

Extra high voltage—up to 400 kv—seems to offer at present the only means of solving some of the transmission problems of capacity and economics in integrated system development.

D.C. transmission at present has not solved all the technical problems confronting its practical use; it is laboring under a severe handicap arising from the cost of terminal facilities.

Distribution properly coordinated with transmission results in major economies; as a system grows, the existing transmission should more and more be given the functions of distribution.

"WE HAVE ADOPTED A POLICY of continual tree-trimming and brush cutting that will bring the crews to a given area at least once every three years"

"I GUESS WE WERE LUCKY. Only a quarter of our original 1,469 transformers were 1½'s. Most all of them have been replaced by 3's and 5's"

"WE WERE BUSY pulling in larger wires and adding conductors to make single-phase lines into V-phase and 3-phase pretty well all around the system"

Managers of Co-operative Electric Systems Talk Over Their Problems

Rapid post-war growth in numbers of consumers and in loads has required fast work in extension and improvement of systems. Getting caught up now

WHAT ARE the problems that today confront managers of electric co-operative systems? How are they being handled; what solutions found for them?

Some answers to these questions are given in this article. ELECTRICAL WORLD makes no claim that all problems of co-operative system management are covered here. Nor do we say that the conditions discussed are common to, or typical of, the whole co-operative picture. We simply present certain information on co-operative system problems as they might come up in the conversation of a group of men who are concerned daily with those problems.

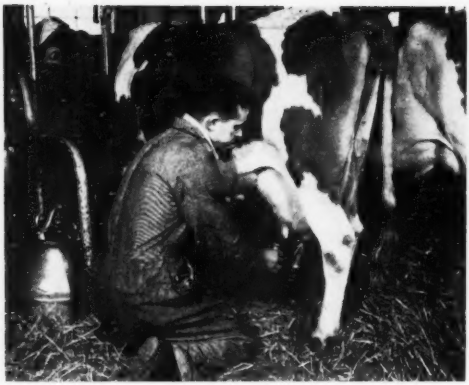
This synthetic conversation has six participants, the men who furnished the material for it. They are managers of co-operatives—Reuben Dooley, Parke County Rural Electric Membership Corporation, Rockville, Ind; A. E. Halterman, Pioneer Rural Electric Co-operative, Piqua, Ohio; Lloyd McCaskey, Oakdale Co-operative Electrical Association, Oakdale, Wis; R. E. Thomson, Carroll County Rural Electric Membership Corporation, Delphi, Ind; C. E. Viverette, Blue Ridge Electric Membership Corporation, Lenoir, N. C.; and Frank E. Ratts, Southeastern Indiana Rural Electric Membership Corporation, Osgood, Ind.

Thomson—"The co-operative manager's responsibility, it seems to me, is to make a small business pay its way. That's putting it very simply, too simply perhaps; but essentially it's just that."

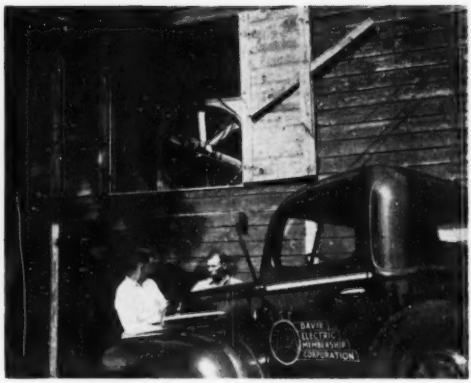
Halterman—"You're right. Our systems are in the class of small business in comparison with our neighbors, the power companies. But we can't use that as an excuse for giving our customers service of any lower quality than they supply to theirs. If we try to pay our way at the expense of service, we'll be sunk."

Thomson—"We can go the way to failure like a lot of other small businesses if we don't keep our wits about us and operate our systems efficiently."

Dooley—"No system can be operated efficiently unless it is designed and built for efficient operation. This is the hook that all our problems hang on. When our lines were first constructed no one expected they would spread so far and be loaded up so fast."



"WITHIN the past 18 months more than 200 farms have changed over from production of the old barnyard type to Grade A milk"



"HAY DRIERS, barn cleaners and all those other things are very few at this time, but we expect a large increase within a few years"

Viverette—"No one expected, either, that a war would come along and kick us twice in the same place. The war made it practically impossible for us to obtain materials and equipment necessary for our lines to keep up with the load as it grew. At the same time it increased farm income and made farmers want more electric service."

McCaskey—"And there we were, trying to serve the post-war load with little old pre-war lines and transformers and substations. In 1942, Oakdale's average monthly consumption per member was 75 kwhr. In 1948 it was 139 and a third of that 139 was post-war increase. Same with consumers. We had 1,234 in 1942 and 3,400 in 1948. And of the 3,400, 1,566 were added since the war."

Ratts—"Our average peak usage by farms is now 144 kwhr and nearly half of it is post-war increase. Same with consumers; of our present 5,309, about 50% came on after the war. We still have about 3,000 members to connect before we approach saturation of our area."

Halterman—"I guess we all have the same story. Of Pioneer's peak month average of 242 kwhr per consumer so far in '49, 103 kwhr is increase since the war. And over 700 of our 5,323 consumers are post-war connections."

Thomson—"Our peak month farm average was 227 kwhr in June this year and 103 kwhr, nearly 50%, of it was post-war rise. And 846 of our present 2,651 consumers were connected after the war."

Viverette—"Same with Blue Ridge although we don't have as high usage per farm as you folks do. Our peak month farm average so far in '49, in July that was, was 70 kwhr and of that, 31 kwhr was post-war increase. And of our present 8,094 farm customers, 4,266 were added since the war."

Dooley—"Our peak month average for the first half of '49 was 170 kwhr and 78 of it was increase since '45. Consumers the same, 2,193 of our 4,285 at the end of last June are post-war additions."

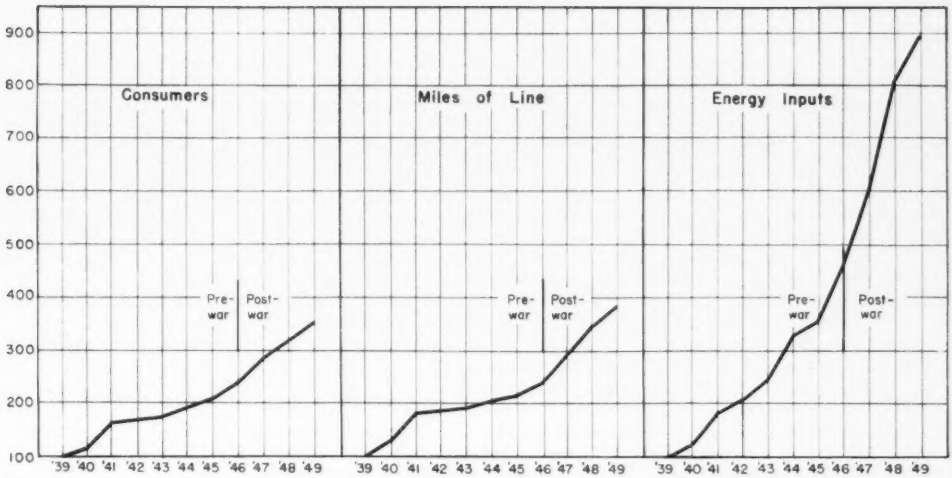
Halterman—"The fact that we six all tell the same story as regards increases in loads and in consumers since the war does not prove that all electric cooperatives are in the same boat. But it certainly looks to me as indicating a pretty general condition. I wonder if we are as close together on specific problems, like quality and continuity of service."

Viverette—"That goes back to what Dooley said earlier about design and construction of systems. Our system, like those of most other co-operatives, had a very small beginning. We never dreamed it would reach its present size in load and extent. Even before the war we were running into problems of outages and low voltage. We couldn't do much about them during the war, but we could and we did make plans to deal with them when the war ended."

Halterman—"Yes, and then we discovered that our plans had to be enlarged and revised because the post-war growth was so much greater than we had anticipated. Most of us managers have lacked either imagination or courage. If we did imagine how fast and how far our systems would grow, then we did not have the courage to spend the money—if we could get it—to keep ahead of growth. But I think we have learned at least a little from experience. I know that in Pioneer, anyway, we are thinking and planning a lot bigger than we used to. We'll be able to handle an average of 325 kwhr by the end of this year and we are now starting plans toward 500 kwhr.

Dooley—"So are we in Parke County. Our system was originally designed for 80 kwhr per month average use. Right now we are spending $77,000 to provide adequate service for a 200-kwhr average which we are going to reach pretty soon. As soon as this work is done, we'll start on the next step, 300 kwhr. We estimate that to cost $48,000. And probably right after that we'll have to begin on the third plan, aiming at 500 kwhr. We can't be perfectly definite about the third step, but we figure it will probably cost us over $100,000."

Ratts—"Our territory was originally considered a poor bet for farm electrification, even by REA. We had a dickens of a time getting our first loan. And now we are planning for nearly double our present system in-



RAPID GROWTH since the war is indicated by rises in consumers, miles of line, and energy inputs—composite indexes of six systems

put in two years—10,000,000 kwhr now, over 18,000,000 in '51."

Thomson—"Carroll County is making plans ahead, too. We expect to have a 375-kwhr average before many years and we're going to be ready for it."

Halterman—"I guess we're all beginning to set our sights higher than we did at first. But what about particular things—outages, for example? What are we doing to improve service continuity."

"On the Pioneer system trees have been the principal cause of outages. When our lines were built, the contractors just cut holes through the trees and ran the wires through. Then in a few years the branches grew into the lines and troubles began. And our first transformers had four-inch external protective gaps that seemed to attract the birds. But trees caused most of our trouble. We've done a lot of trimming already and still have a lot more to do."

McCaskey—"I think that was pretty much the general case. We've been so busy with new construction since the war that we have not had time for as much tree trimming as we'd like. But we got an extensive program going last fall and are planning to increase it."

Ratts—"Up to now, we've only been able to do essential tree trimming. Too busy growing, like McCaskey says. The sycamores and sassafrasses in our country grow fast, but we are getting set to deal with them."

Viverette—"We have adopted a policy of continual tree-trimming and brush cutting that will bring the crews to a given area at least once every three years. After we get the system cleared, we figure that a "once over lightly" at regular intervals will keep the trees and brush under control. Also we are experimenting with chemical brush control."

Thomson—"For about 16 months now, we've had a crew with a chain saw doing nothing but cut down trees and trim them in front yards. So far we've spent about $30,000 on this program. We are now chemically treating our re-cleared rights-of-way."

Dooley—"We are trimming trees in Parke County, too. But lightning has been our worst offender in outages. Arrester failures have caused more outages on our system than any other single factor. But these failures are declining in number with improvements in arresters."

Halterman—"Perhaps more important than the number of outages is their duration and the number of consumers affected. In the early days we didn't know—I guess nobody knew—very much about sectionalizing and about co-ordination of fuses and of breakers. Fuses were just installed wherever it looked reasonable and often of same size and of the same time characteristic all over the system."

Viverette—"But we are getting well away from that condition now. I don't believe there are very many co-operative systems that have not made great improvement in this respect. Several hundred of Blue Ridge's over 10,000 consumers are non-farm three-phase users. We use three-phase reclosers at all our substations on outgoing feeders. And we have about 100 single-phase reclosers over the system. These, with co-ordinated fuses, keep to a minimum the duration and extent of outages."

Dooley—"Oil circuit breakers are being installed on our system as rapidly as possible, with the lateral lines protected by single-shot fuses. These fuses were selected with as wide a time range as possible in order that the breakers will clear all temporary faults. This method gives greater protection with less investment than any other we have considered."

Thomson—"We recently completed an entirely new sectionalizing set-up. We installed breakers operating on the 'hold closed' principle with fuses co-ordinated so that there is a maximum of 10 miles to patrol for locating faults. We've just been through three rather severe lightning

storms and the set-up works beautifully."

Halterman—"We had a system study made two years ago. The recommended sectionalizing of lines and coordination of breakers and fuses is now about 80% complete."

Ratts—"In 1945 we started what we thought was an ambitious program to improve regulation and continuity. But we had to drop it in 1948 after spending $32,500 for reclosers and other sectionalizing equipment. The system had grown out of it. So we had to make a new study and lay out a bigger program. We'll start construction on it this fall, hoping we've aimed high enough."

Viverette—"Outages have been, and still are, a matter for close attention, but more important, I think, is the problem of adequacy of facilities, running all the way back from the consumer's meter to the supply substation. We started out in 1938 with one substation of 225 kva. Now we have four input substations totalling 8,075 kva and a small hydro plant of 175 kw that floats on the line and gives about 100,000 kwhr a month. Also inside the system we have two other substations, 750 kva and 150 kva, supplied from the input subs. While this growth was occurring we were busy pulling in larger wires and adding conductors to make single-phase lines into V-phase and three-phase pretty well all around the system. These substation additions and line improvements, plus the judicious installation of regulators have given us a pretty good voltage picture. But we still make constant checks of voltage because that is the only way to keep on top of the voltage regulation problem."

Dooley—"We have had some voltage trouble and poor regulation, but not for long periods of time. We have usually managed to take some kind of corrective action—installing regulators, re-phasing or reinforcing lines—to cure the condition quite quickly. At the present time voltage regulation at the extreme points of our system does not exceed 10%."

Thomson—"We do pretty well on voltage regulation, I think. At one of our substations we can maintain a 123-v level and at peak times the lowest voltage in that part of the system is about 118. But at our other substation the feed is not regulated and the input level varies from 122 to 112 v. We have several step regulators on the longest lines from this sub but we do lose about 8 v at peak times. That brings our end-line level down to 104, which is not so good."

Halterman—"Getting back to equipment capacity, I suppose you've all had the same experience with transformers that Pioneer has had. Originally 90% of ours were 1 kva. They were all right for a while. Then we had to start replacing them with 3's and 5's. We put the larger cores into the 1-kva cans. We've done that with about 70% of the originals. Now we are buying only 7½- and 10-kva and larger."

Thomson — "On the Carroll County system we had between 1,300 and 1,400 1½- and 3-kva transformers. About 250 of them have been replaced with larger sizes. For about two years now we've bought only 5-kva and larger sizes. Occasionally we hang a 1½ or a 3 for special cases, but the normal farm installation is now 5 kva."

Ratts—"I guess we were lucky. Only a quarter of our original 1,469 transformers were 1½'s. Most all of them have been replaced by 3's and 5's. We have not bought any 1½'s for years. A 5-kva tub is commonplace on a farm service now."

Viverette—"The bulk of our farm consumer transformers are 1½ and 3 kva. Since the end of the war we have not bought any 1½'s. And from now on, we won't buy any 3's. As we approach complete coverage of our area we find that the change-out of the smaller transformers will be sufficient to take care of the small loads in new connections. Our future purchases will be at least 10 kva."

McCaskey—"All this while we've been talking about the supply system that brings electricity to the farmer. What's he using it for and how much more of it will he use?"

Dooley—"We have a fair idea of the answer to the first part of your question, but I don't think anyone can even guess at the answer to the second part. We do know that most of the farm use of electricity is in the home. On our system of around 4,300 members there are about 2,000 refrigerators, 800 ranges and 600 water heaters. These, with smaller appliances and lighting, are the major part of the farm load. Use of electricity in farm production operations has hardly begun. That's where Halterman's remark about lack of imagination really applies."

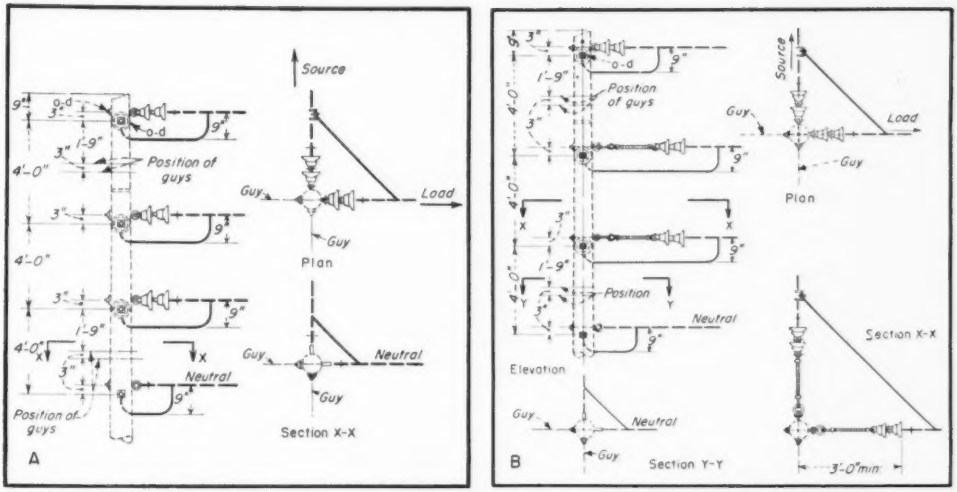
Halterman—"Yes, that's right. Take the Pioneer system, for instance. It's only in dairy applications—milking machines, milk coolers and dairy water heaters—that we have significant saturation of electric equipment. The other production applications—hay driers, welders, feed grinders, silo fillers and unloaders, barn cleaners and the other hundred or more—are not yet really started to grow."

Thomson — "As you say, hay driers, barn cleaners and all those other things are very few at this time, but up in Carroll County we anticipate a large increase within a very few years."

Viverette — "We see that same dairy picture in our Carolina hills. Within the past 18 months more than 200 farms have changed over from production of the old barnyard type to Grade A milk. And they have done it with electric equipment, including water systems, which, by the way, we forgot to mention earlier."

Halterman—"Probably we overlooked water systems because we took it for granted that everyone knew that this is the most useful electric application in both farm home and barn."

Dooley — "We've been talking quite a while. Maybe the readers of ELECTRICAL WORLD are getting tired of our conversation. If they're not, we'd better stop before they do. I'd like to button this up by saying that the way of life across rural America has changed with the advent of electricity on the farm. The farmer now can have and is rapidly obtaining every convenience available to urban people. In addition, the farm is an ideal place to live and rear a family. Electricity is making this possible. The farmer realizes this and is making use of this new servant, for both better living and better profits. It is our job—co-operatives, power companies, all of us concerned with rural electric service—to see that he gets electricity in the quantity and quality he needs."



VERTICAL CONSTRUCTION of 3-phase 4-wire star primaries, 60 to 90 deg angle. Although both construction methods are now commonly used and are permissible, it is expected that (B) will supersede (A) in the next version. Minimum conductor separation dimensions are shown

Line Specifications Improved To Meet Expanded Needs

REA revises standards and procedures for benefit alike of cooperatives and contractors in facilitating construction for better service, safety and performance

J. K. O'SHAUGHNESSY
Chief, Engineering Division,
Rural Electrification Administration

THE RECENT REVISION of REA's "Distribution Line Construction Contract" is simply another illustration of the policy of REA to adapt its procedures and practices to changing conditions so that borrowers and their engineers, contractors, and materials suppliers will obtain the full benefit of all developments that tend to give rural America the best electric service at the lowest possible cost.

Many changes have been made in the construction contract since its last revision in 1946. These changes were announced from time-to-time in addenda and supplements and now have been incorporated into the text of the revised contract.

A number of drawings in the new contract have been modified to conform with changes in apparatus design or construction practices.

Revision of the construction contract also provided a welcome opportunity to make REA-financed construction more attractive to contractors and engineers engaged in this work. To this end the revised contract was fully discussed with contractors' organizations before final adoption and an understanding reached on all controversial points.

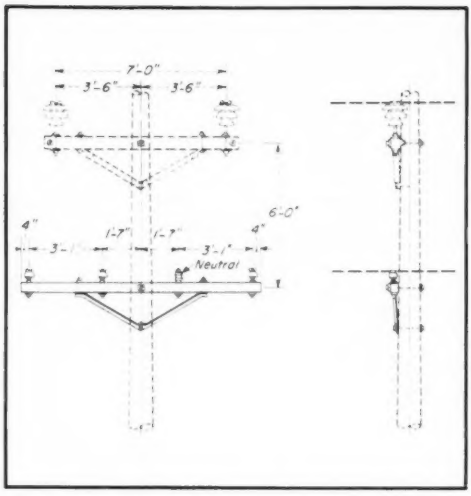
The principal objective which was sought and accomplished was a method of clearly and concisely describing the job to be built and, furthermore, providing for adherence to the job so described. This gives information necessary to prepare an intelligent bid and eliminate insurance needs against unknown contingencies.

Another change will minimize delays in paying contractors for work completed.

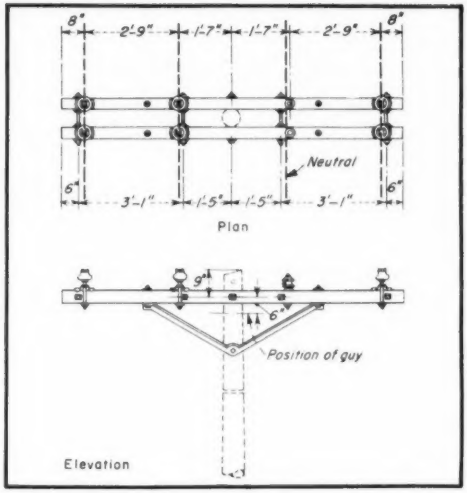
Principal changes made in the new construction contract are detailed in the following paragraphs.

The plans, specifications, construction drawings and necessary forms are supplied bidders upon payment of $10.00 which is not refunded. [Previously $25.00 and refunded.]

Any bidder who has completed line construction for REA borrowers is no longer required to submit bidder's qualifications. [Formerly all bidders submitted qualifications.]



NEW SPECIFICATION for single-circuit underbuild on higher voltage line maintained by same crews



FOUR-WIRE primary construction recommended for conductors with breaking strength of more than 4,500 pounds

A bid bond or certified check may be used to accompany each proposal. [Use of bid bond is new.]

The bid bond or check is to be held not exceeding 60 days from date of bid opening. [Was held 90 days.]

An entirely new provision has been added stating that: (a) Any materials to be furnished by the owner are on hand or will be available when required at locations obtainable from the engineer, (b) that all easements and rights-of-way have been obtained except as shown on maps of the plans and specifications, (c) that all staking except as shown on the maps in the plans and specifications has been completed and sufficient staking crews will be available to maintain stakes in advance of construction and that (d) the owner will have available all funds necessary for immediate payment for construction. If the owner fails to comply with any of the above presentations or they are incorrect the contractor will be entitled to an extension of time equal to the delay occasioned thereby.

Contractors Proposal

The provision for showing alternate bids and the provision for including or excluding the right-of-way bid in determining the total amount of the bid has been deleted. Right-of-way clearing units are now called R1-10R, R1-20R, R1-30R and R1-40R under the new provisions.

The bidder will include the cost of preservative treatment and inspection in the prices for poles and will supply certified poles and furnish the owner such certification. [Supplying certified treated poles was formerly optional.] The cost of labor for changes in construction previously installed shall not exceed twice the actual cost as shown on the payroll. New or replacing units shall be made at prices quoted in the proposal. The bidder warrants that it has adequate financial resources and if the proposal is accepted will furnish a contractor's bond with sureties listed by the United States Treasury Department as acceptable sureties. [Sureties satisfactory to owner and administrator satisfactory in past.]

The bidder agrees to commence construction within 30 [formerly 10] calendar days (excluding Saturdays, Sundays and legal holidays) after written notice from the Administrator of approval of the contract. The bidder will not be required to do certain work, when, in the judgment of the engineer, the weather renders it impractical, and provides for an extension of the time of completion for this contingency. [Reference to engineer's judgment is new.]

If any substantial change is made in the construction to be done which materially increases the cost to the contractor the owner will pay the contractor the reasonable cost in accordance with a construction contract amendment provided the contractor shall have made a written request to the owner prior to the commencement of work in connection with such change or addition.

Pole numbering will be done as designated by the engineer.

Under an entirely new clause of the construction agreement the contractor may elect to receive payment in full for any section of the project providing: (a) The completion of construction for such section has been certified by the engineer and approved by the Administrator, (b) the affidavit in respect to labor and all releases of liens for such section have been submitted, (c) the final inventory for such section has been approved by the Administrator and (d) consent of the surety or sureties on contractor's bond to payment in full for such section has been submitted.

Interest at the rate of 6% shall be paid by the owner to the contractor on all unpaid balances due on monthly estimates commencing 15 days after due date and final payment for the project, or a completed section, commencing 30 days after due date provided the delay is not caused by any condition within the control of the contractor. [A new provision.]

Section 4 has been revised so that

the contractor shall maintain not less than $50,000.00 insurance for bodily injury or death for one person and $100,000.00 for each accident; insurance for property damage not less than $10,000.00 for each accident and $25,000.00 aggregate for accidents; automobile public liability insurance of not less than $50,000.00 for one person and $100,000.00 for each accident and property damage insurance limit of $5,000.00 for each accident. *Upon request* by the Administrator the contractor shall furnish a certificate evidencing compliance with the above. [Amounts of insurance specified are in all cases much higher than previously.]

The contractor shall furnish weekly an affidavit (kick-back statute) and shall preserve a payroll copy for three years from date of completion.

The contract is not effective unless approved by the Administrator within 45 days from date of execution by the owner and the bidder.

Western larch, jack pine, red pine, and ponderosa pine have been added to timbers acceptable for REA use.

A requirement that all poles treated full length must be bored, roofed and gained before treatment is included.

Crossarms shall be treated douglas fir or treated southern yellow pine and shall conform to "Specifications for the Treatment and Inspection of Treated Timber Purchased by REA Borrowers." [Only untreated, unpainted douglas fir formerly.]

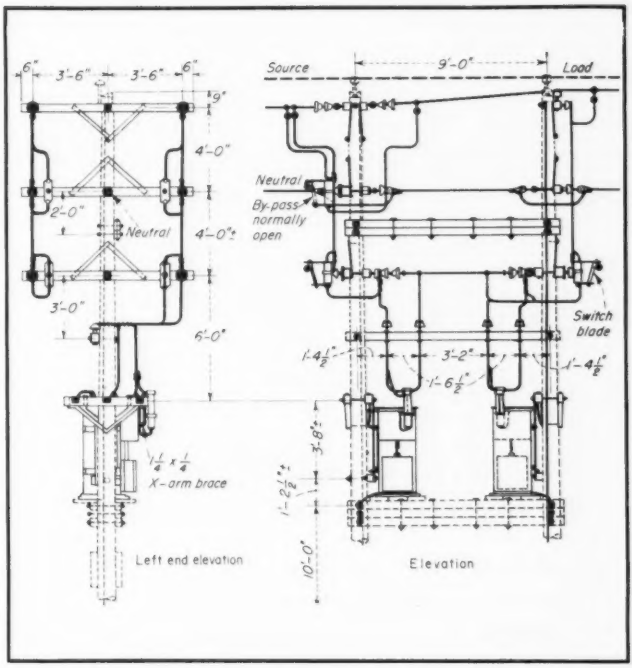
Pole protection assemblies have been added. Pole protection electrodes shall be of copper or other nonrusting material.

Overhead low voltage covered conductors shall be in accordance with specifications approved by the engineer and the administrator. [Medium TBWP copper has been required.]

7200-v transformers shall have 4–2½% below-normal taps [formerly 3–4½%] and 7620-v transformers shall have 2–2½% above-normal taps [formerly none] and 2–2½% below-normal taps [formerly 4].

Project's scope now includes two and three wire secondaries and services, underbuild, conversion, removal, substations and clearing units.

The depth of setting in soil for 20-ft poles is 4.0 ft, and for 55-ft poles is now 7.5 ft and for 60-ft poles is now 8 ft [previously 7 and 7½ ft.]



PRIMARY 2-phase wires and neutral stop voltage regulator pole or platform mounted

"Setting in Soil" specifications apply where poles are set in soil, where there is a layer of soil more than 2 ft over solid rock and where the hole in solid rock is not substantially vertical or the diameter of the hole at the surface of the rock exceeds approximately twice the diameter of the pole at this point. "Setting in all Solid Rock" specifications apply where poles are set in solid rock, and where the hole is substantially vertical and large enough to permit the use of tamping bars the full depth.

Poles set at points of strain shall be raked against the strain not less than one inch for each 10 ft of pole length nor more than two inches for each 10 ft of pole length after the conductors are at the required tension. [No previous detail.]

For neutral and secondary conductors on poles, insulated brackets may be substituted for the single and double upset bolts on angles of 0 degrees to 5 degrees in locations known to be subjected to vibration.

Slack in jumpers and leads shall be provided by at least two bends (not right angle) in a vertical plane or one in a horizontal plane or the equivalent. [Previously right angle.]

In clearing right-of-way trees shall be removed, underbrush cleared and trees trimmed so that the right-of-way, except for stumps which shall not exceed a specified height, shall be clear from the ground up. [No previous rule.]

Leaning trees beyond the right-of-way which would strike the line in falling and which would require topping if not removed may be removed or topped at the option of the contractor with the exception of shade, fruit or ornamental trees which shall be trimmed unless otherwise directed by the engineer. [No previous rule.]

Specifications for secondaries and the definition of a service drop have been deleted.

There shall not be more than one splice per service conductor in any span and splicing sleeves shall be at least 10 ft from the conductor support. [No previous rule.]

Low-Cost Regulation Needed For Rural Loads

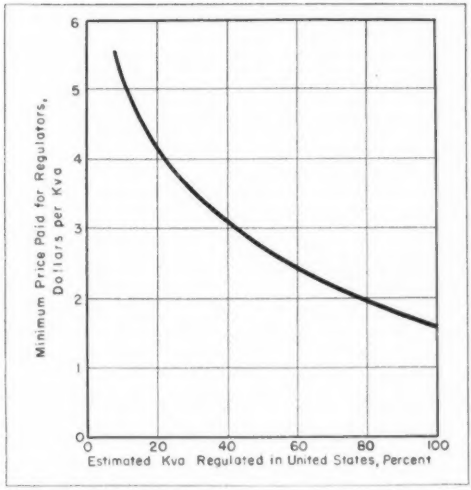


FIG 1—FOUR-FIFTHS of loads are regulated with load ratio control on regulators costing about $2 or less per kva regulated

About 80% of regulated kva in the United States is handled by units costing less than $2 per kva and consists of loads averaging more than 7,500 kva. Small rural loads need regulators of like performance and cost

G. W. CLOTHIER
Manager, Transformer Section
Allis-Chalmers Mfg Co
Milwaukee

THE COST of regulation is fundamental in determining the method used to provide constant voltage at customers' load. As an illustration, the estimated installed regulating capacity in the country today is shown in Fig 1. This curve presents *cost per kva regulated* plotted against the *relative amounts of kva regulated*. Data for the curve includes all types of regulators, feeder voltage regulators, induction regulators, load ratio control transformers and unit type substations. As shown, most voltage regulation is accomplished at relatively low cost per kva—in general less than two to three dollars per kva regulated.

Decreasing Cost Per Kva

This approximate cost of existing regulation in dollars per kva regulated is shown in Fig 2. The relatively higher cost of smaller regulators has made it impossible to apply regulators to rural circuits where the loads are small and consequently, the cost per kva of regulation high. For example, Fig 1 and 2 show that about 80% of the kva regulated is accomplished with regulators costing less than $2 per kva. Yet, if regulation is to be obtained at less than $2 per kva at present prices, it must be purchased by securing machines having capacities of more than 7,500-kva load.

So, if small loads are to be regulated, a low-priced specially designed small regulator is essential for large scale use. To approach the reliability of today's distribution transformer with such an automatic regulator which must operate intermittently on a pole in an isolated area with little provision for maintenance, imposes severe design requirements. These include: (1) Provide regulated rural lines with the same quality of regulation as urban feeders; (2) be satisfactory for both private utility and REA service; (3) have the control panel comprise essential functions of the larger regulators, but readily accessible for test or adjustment and yet sealed from dust and moisture; (4) keep tap-changing mechanism and autotransformer maintenance-free except for routine inspection; (5) be suitable for either pole or platform mounting; (6) have cost compare favorably with that of station type regulators, without sacrificing dependability or accuracy of voltage control; and (7) provide lightning and impulse strength level as high as that of transformers or other equipment on the line.

To meet these requirements, a low-cost regulator was designed following the general principle of the station step-type regulator. In general, working parts were built on a smaller scale and adapted to mass production methods.

20% Regulation Range

The circuit of the regulator consists of an autotransformer having a series winding with eight taps. A reversing switch in the series winding is used for either "raise" or "lower" voltage. As an integral part of the tap changing mechanism, the reversing switch provides a full range of regulation from -10% to $+10\%$ of the rated voltage. Eight taps and a bridging autotransformer provide 32 steps, each of $\frac{5}{8}\%$. The self-con-

tained automatic control and power supply of the regulator includes a voltage control relay, built-in potential transformer measuring the output voltage of the regulator, and a line drop compensator. A voltage integrator averages voltage over a short interval of time so the regulator maintains a constant average voltage. By means of this integrator a correctional effect is exercised on otherwise accentuating voltage swings.

Show Long Life

The first experimental unit of the low-cost regulator was installed on a Wisconsin system early in 1944. Subsequently other units have been tested on both REA and private utility lines in different parts of the country, in all kinds of weather, under all conditions of load. Simultaneously, life tests have been carried on at the factory. Test records of well over a million operations (1,750,000 in one instance) without excessive wear have been common.

Representative results of a typical operating period are shown in Fig 3, where the regulator was used on a 1-ph circuit regulated to some extent by standard four-step boosters. As shown on the voltage graphs below, the voltage was maintained within approximately a $1\frac{1}{2}$-v band.

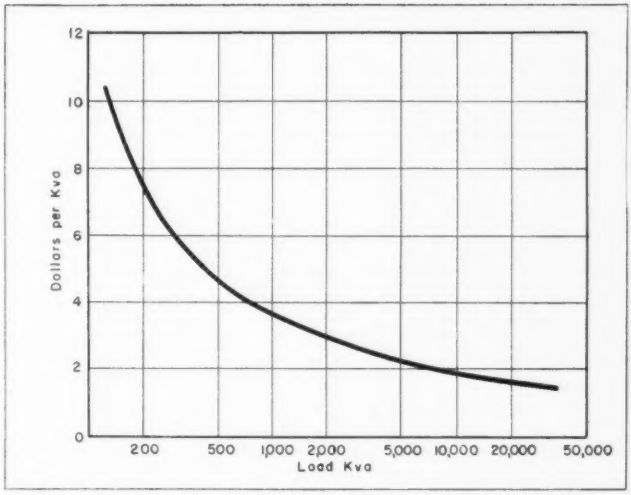


FIG 2—APPROXIMATE COST of regulation with station type regulators of 20% range

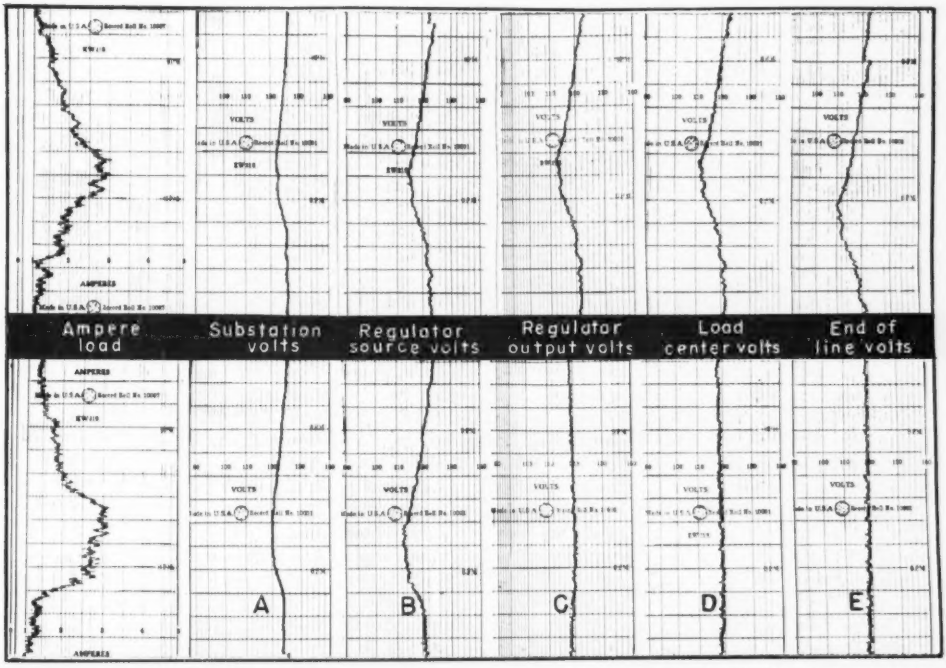
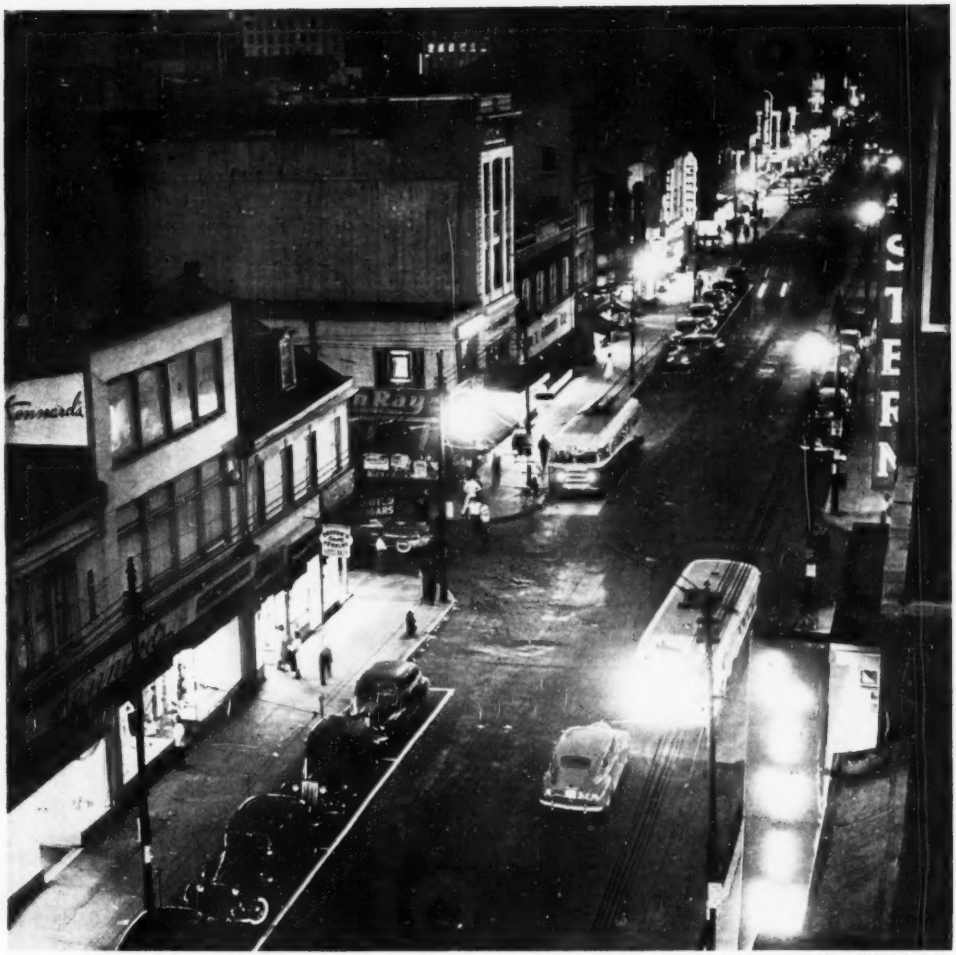
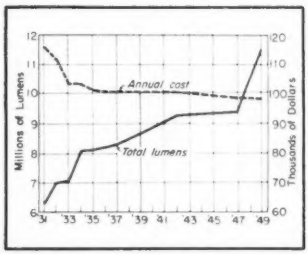


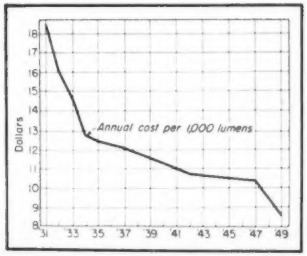
FIG. 3—CONTINUOUS VOLTAGE GRAPHS show results obtained. At top is the record made on feeder prior to regulator installation. Below is the approximately $1\frac{1}{2}$-v band maintained by regulator on a rural circuit



General Electric Photo

ON THIS business street 10,000 lumen units are installed staggered on 100-ft spacing giving a surface intensity of 1.75 ft-c. Traffic injuries in Wilmington during 1948 were under those of 1933 despite state-wide increase of 15%, with 100% more motor vehicles

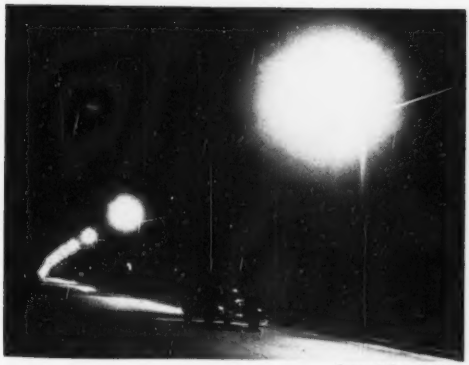




DOWNWARD MOVEMENT of cost and upward movement of light delivered (left) result in spectacular decline in unit cost of street lighting in Wilmington

Table I—Costs of Street Lighting Wilmington, Del.

Year	Total Cost	Amount of Light (Total Lamp Ratings) 1,000 Lumens	Cost per 1,000 Lumens
1931	$115,980.27	6,269	$18.50
1932	111,893.40	7,018	15.94
1933	103,450.00	7,090	14.59
1934	103,488.72	8,128	12.73
1935	101,253.12	8,145.6	12.43
1937	100,457.50	8,313	12.09
1942	100,638.75	9,332.5	10.78
1947	98,736.00	9,428.5	10.47
1949	98,736.00	11,524.5	8.57



General Electric Photo

INTENSITY of 0.55 ft–c per sq ft is provided on heavy traffic artery by 6,000 lumen units spaced at 140-ft intervals

General Electric Photo

LUMINAIRE gets a looking over by Foreman Harvey Walmsley and lineman W. P. M. Pyle before installation

More and Better Street Lighting At Less Cost

Master plans of improvement started 18 years ago now approaching completion after being slowed up by depression and war

E. F. KOESTER
City Engineer, Wilmington, Del.

"MOST SAFELY LIGHTED city of its size in the world" is the distinction aimed at by Wilmington, Del. And the author of this article thinks the claim to such title is in fair way to being justified because the city is now nearing completion of a long-term program of modernization of illumination on traffic ways, and plans for lighting improvement on secondary streets are now in hand. Resulting from the program, it is believed that Wilmington now has more miles of downtown and arterial streets lighted according to modern standards than any other city of comparable size. This result was accomplished over a period of years without any particularly large investment in facilities at any one time. The net effect has been to lower the annual rate per luminaire, as well as a marked reduction in the cost per 1,000 lumens of light.

Shown in the accompanying tables and graphs is the record of decline in street lighting cost to the city. In the period 1931–1949, annual cost declined from $115,980.27 to $98,736 (14.8%), while amount of light delivered increased from 6,269,000 to 11,524,500 lm (83.6%). In unit terms, this is a decrease from $18.50 per 1,000 lm to $8.50 (53.7%). At the 1931 cost per 1,000 lm, the 1949 annual cost would have been $213,203.25, or 2.18 times as much as it was actually.

This spectacular decline in cost

Table II—Declining Rates per Street Lighting Lamp—Wilmington, Del.

	1930	1931	1932	1933	1934	1935	1937	1942	1947*	1947 Percent Reduction under First Rate
1,000-lm Wood Pole Bracket—4 ft	$30.00	$24.00	$23.00	$23.00	$23.00	$22.50	$21.75	$21.00	$20.00	33.3
1,000-lm Center Suspension	33.00	27.00	26.00	26.00	26.00	26.00	24.75	24.00	23.00	30.3
1,000-lm Metal Pole	.....	32.00	31.00	31.00	31.00	24.00	24.00	24.00	23.00	28.1
2,500-lm 4 ft Bracket	.....	48.00	35.00	35.00	35.00	35.00	31.00	30.00	26.00	45.8
2,500-lm Orn. Standard	48.00	48.00	40.00	40.00	40.00	35.00	31.00	30.00	26.00	45.8
2,500-lm Orn. Standard (Special)	.....	50.00	50.00	50.00	50.00	50.00	46.00	45.00	40.00	20.0
6,000-lm Center Suspension	78.00	78.00	63.00	63.00	63.00	63.00	57.00	53.00	49.00	37.2
6,000-lm 15-ft Mast Arm or 4-ft Brkt	.....	75.00	60.00	60.00	60.00	60.00	54.00	50.00	46.00	38.7
6,000-lm Orn. Brkt—Sollux Sr	75.00	75.00	60.00	60.00	60.00	60.00	54.00	50.00	46.00	38.7
6,000-lm Orn. Concrete or Metal Pole	90.00	90.00	90.00	90.00	90.00	83.00	76.00	70.00	68.00	24.5
10,000-lm Orn. Brkt. Wood Pole	.....	.....	.....	100.00	85.00	78.00	70.00	66.00	64.00	36.0
10,000-lm Orn. Brkt. Existing Metal Pole	.....	.....	100.00	100.00	85.00	80.00	72.00	68.00	66.00	34.0

*1947 rates fixed by contract for 5 years

General Electric Photo

SERIES CIRCUIT connection to a new lamp on important business thoroughfare is being made by lineman, Samuel Beird

General Electric Photo

WILMINGTON caps its 5 previous traffic safety awards with the Grand National Award in competition with 458 cities of all sizes

stems directly from the long established philosophy of the local electric company in respect to street lighting. The electric company policy has been to provide street lighting service at the lowest practical cost. The company is aware that the lighting of the public streets is a service rendered to the community as a whole and from which each citizen derives individual benefits. It is also to be remembered that that same citizen pays the cost of the street lighting through his taxes, and so this policy also reacts to his benefit as far as his pocketbook is concerned. The decrease in rates for different sizes and types of luminaires in Table II reflects the effect of this Company policy over many years.

The tables and graphs covering the period 1931–1949 clearly reflect the effects of five general rate reductions and four specific street lighting rate reductions. The latest street lighting change made in 1947 will be in effect for the next 5-year period. This recent street lighting contract with the city has the unusual feature of providing the effect of a rate reduction by the electric company's agreement to supply approximately $6,000 worth of additional modern lighting on main business thoroughfares without increasing the city cost of $98,736 per year. The new street lighting installations were just completed and the accumulated credit of approximately $6,000 per annum for the 2-year period will be used by the city for relighting a number of important secondary streets. The effect of providing a rate adjustment in the form of additional street lighting clearly shows on Table I for the yearly periods 1947–1949. This indicates that the annual cost has not been changed, but the amount of light furnished is greatly increased.

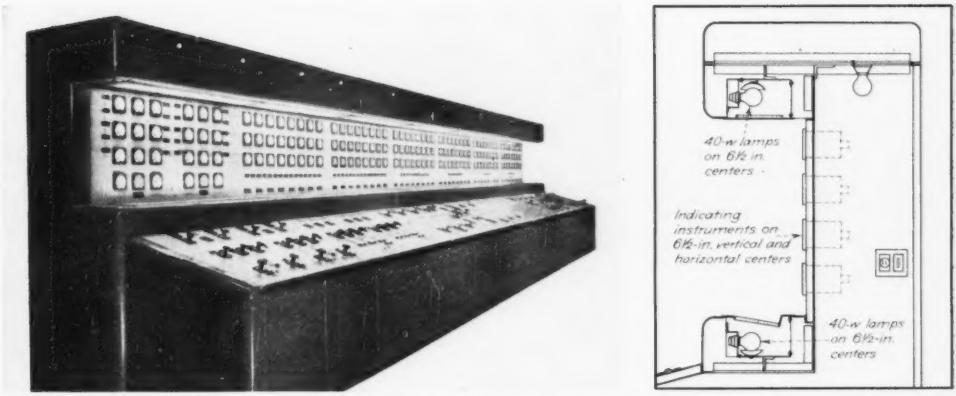
It was in 1931 that the Delaware Power & Light Co. at the request of the Street & Sewer Dept of Wilmington, submitted a 10-year master plan of street lighting improvement. The plan was accepted and work was started, but proceeded only slowly because of the depression, then was further delayed by World War II. Since the war, the program has been progressing rapidly and the first part of the master plan pertaining to main and arterial streets is now virtually completed.

About 23 miles of major business and traffic streets have been relighted. Those carrying heavier traffic—800 to 1,200 vehicles in peak hours—have 10,000 lm luminaires on spacings from 75 to 125 ft depending on traffic density. The others are lighted with 6,000 lm units on 100 to 140-ft spacings. The applied illumination varies from 50 to 100 lm per lin ft according to traffic requirements. Using the IES basic formula, the values referred to result in effective street surface illumination of 0.5 to 1.75 ft-c per sq ft. The second part of the program consists of the relighting of feeder and other secondary streets. This program is about to be started, and in general calls for the use of 2,500 lm units on 150-ft centers, with two units at street intersections.

The true value of Wilmington's street lighting may be measured in even more dramatic figures than dollars and lumens, since the city has been the recipient of five traffic safety awards dating from 1935. The progressively higher awards reached a zenith in 1947 when the Class Award for cities of 100,000 and 200,000 population was presented, along with the Grand National Award in competition with 458 cities of all sizes throughout the entire United States.

CORRECTION

We inadvertently failed to follow our usual custom of acknowledging source of material in article published in August 27 issue of EW entitled "Purchasing Department Focal Point Of Mechanization Program." The article was an abstract of a talk presented by Mr. R. P. Snow, Chairman of the Purchasing and Stores Committee of EEI before a meeting of that committee at St. Louis, Mo., May 9, 1949. This field of study is just one of a series which this committee is investigating.



LIGHTING SYSTEM was added to conventional benchboard. Lamps were installed at top and bottom of each row of instruments

Built-in Lighting Added To New Benchboard

Meter faces flooded with sufficient light from top and bottom to remove reflections of station lights and windows

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Engineering Department
Rochester Gas & Electric Corp
Rochester, N. Y.

INSTALLATION of incandescent lamps as a built-in design on a new benchboard has been made to avoid reflections. The station control board illustrated is installed in a generating plant built by the Rochester Gas and Electric Corp on the shore of Lake Ontario just outside the City of Rochester, N. Y. As this station is an all new plant, there was no existing equipment to match. It was therefore decided to make an attempt to remove the reflections of station lights and windows from the meter faces of the main switchboard by changing the board lighting.

This switchboard consists of seven sections with provision for future additions; controls two generators (Sec 1), two 13.8-kv generator busses (Sec 2), an outdoor 34-kv substation (Sec 3 and 4) and an outdoor 11-kv substation (Sec 6 and 7). It is a more or less conventional type of benchboard design, except that the vertical or instrument section and the sloping or control section have been separated sufficiently to allow the insertion of a light source above and below the meter panel as shown in the accompanying sketch. By placing the light source at these two points it was possible to flood the face of the board with sufficient light to remove undesirable reflections without showing a reflection of its own illumination.

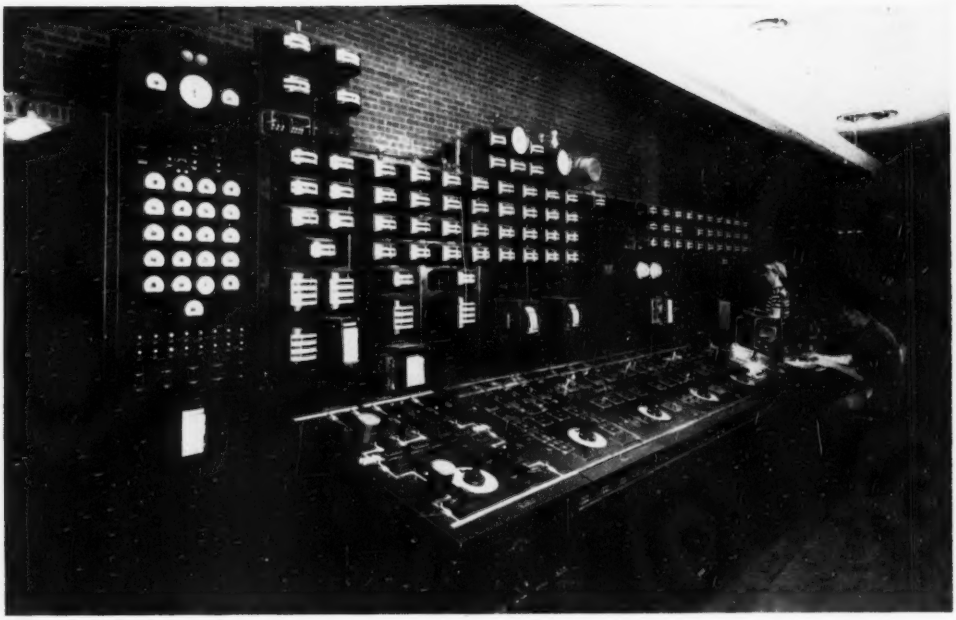
Prismatic Lens Units

The light source itself is a prismatic glass lens unit with one 40-w bulb in both the upper and lower housing, placed on the same centerlines (6½ in.) as the vertical rows of instruments which, in turn, are directly above the associated control switches on the panel below. As each section controls eight circuits (except the generator section) it contains eight vertical rows of instruments and sixteen 40-w bulbs. The lenses in the upper housing are horizontal and in the lower housing are tipped 10 deg towards the board. They are so positioned with relation to the bulb behind them that no light comes towards the operator but is transmitted at a 15-deg angle through the lenses towards the board. The canopy containing the top lighting units also acts as a partial shield to prevent outside light sources from reaching the meter faces.

Saturable Reactor Dimmer

Additional features are: The use of a saturable reactor dimmer in the lighting circuit so that the operator may set the illumination level at that point most comfortable to his eyes, plus the installation of the entire control board in a room having an arched ceiling with indirect cove lighting to further remove any source of undesirable reflections. The cove lighting consists of 8-ft fluorescent tubes having manual voltage control to set illumination level of the general room lighting.

As this station has been in operation only a few months and the general station lighting is not completed, no definite conclusions can be drawn but from the experience obtained so far—the lighting as applied to the main control board has been very satisfactory.



CONTROL IS CENTRALIZED for generated power and primary distribution system. Safety cups cover handles at left foreground

Electrical System Keeps Pace With Plant Growth

Sectionalized double-bus, isolated phase construction, and selective switching insure dependable electric power supply for 24-hours a day, 365 days a year production from big chemical processing plant

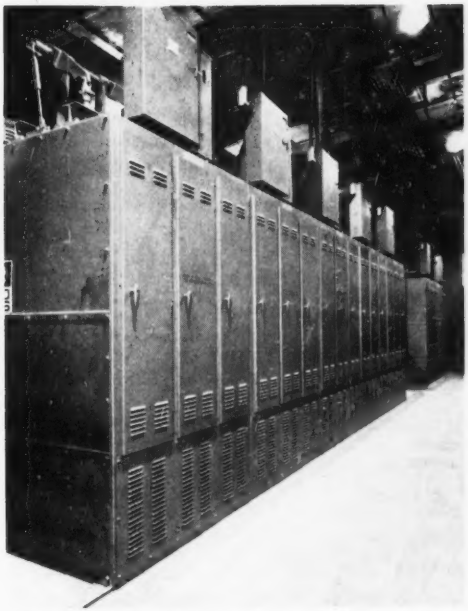
J. A. HORACEK Superintendent of Electrical Div
W. M. AHLSTROM Assistant Superintendent of Electrical Div,
Diamond Alkali Co, Painesville Plant, Painesville, Ohio

RELIABLE electrical distribution is an especially important factor in integrating the output of the nine production units in the mile-long plant of the Diamond Alkali Co at Painesville, Ohio.

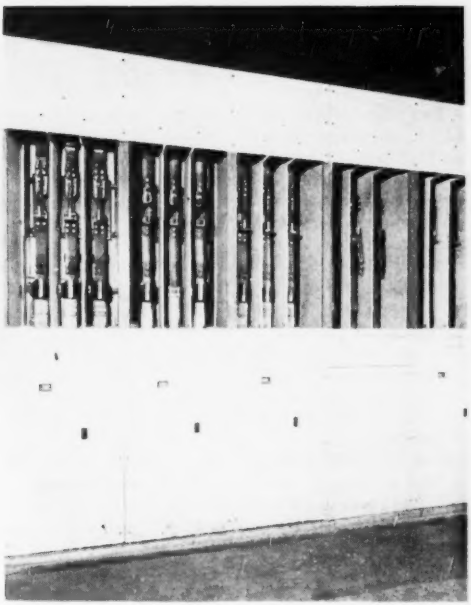
To produce tonnage quantities of basic alkalies and about 60 derivative chemicals, the plant electrical system distributes about 50,000 kw. The load includes about 3,000 motors, ranging in horsepower from fractional to 1,700 hp. With continual growth of load during the past 37 years, additions to the a-c. system have followed a consistent pattern of distribution development. This has been practicable because of careful initial analysis and good original economic planning.

Today, the net result is an electrical distribution system that embodies several features, namely: (1) Sectionalized double bus to minimize possible damage in case of trouble as well as to facilitate maintenance and future connections without service interruption; (2) isolated phase construction and (3) selective switching. All contribute importantly to dependable power supply in various manufacturing or processing departments on a 24-hour schedule, day-in and day-out, with a minimum of production downtime.

Like most industrial plants, the plant's first electrical system in 1912 was 230-v d-c. About ten years later, some 2,300-v, 60-c a-c power was in stalled. From that time on, d-c. power generation and application were reduced to minimum levels as steadily as proved feasible and a-c power was



METAL-ENCLOSED 13.8-kv switchgear with isolated phases provides 100,000,000 kva interrupting capacity



PHASES ARE ISOLATED as shown here in the chlorine manufacturing department, for the entire 2,300-v distribution system

supplied to fulfill increasing power demands. Many problems more or less characteristic of chemical plant operations were encountered during this period of d-c to a-c conversion and installation of additional capacity. As the plant expanded, power installations were designed so they would not have to be rebuilt should later additions be made to the electrical systems. Thus a new switch structure was designed and constructed in the power plant to handle the circuit from a new 5,000-kw, 2,300-v generating unit as well as switching for existing, newly-installed and probable future feeder circuits.

Double-Bus System

Built with a double bus system, including required switching to facilitate cleaning and future connections without interrupting service, this 2,300-v switch structure used isolated phase construction with brick walls and Alberene slabs, 15,000-v insulators, and with oil circuit breakers then rated as capable of interrupting 120,000 amp in a 2,500-v circuit—the greatest interrupting capacity obtainable at that time. Breakers in the original 2,300-v structure, replaced by units having higher interrupting capacity, were reinstalled at the cement production unit then under construction.

Use of current limiting reactors at the power source made this possible. All feeder circuits emanating from this structure were equipped with these reactors below the breakers. Two tie circuits, one for each bus section, were installed between the new and old switch structures.

Meanwhile, at the cement plant, a switch structure incorporating a double bus system was installed. This structure was served by two feeders from the power plant, each being connected to individual buses through an oil circuit breaker and disconnecting switches. In addition to a bus tie circuit installed in this structure, the essential 2,300-v circuits were arranged with appropriate switching to make their service available from either one of the two buses.

The 220-v power and lighting requirements at the cement plant were served by a bank of three 400-kva single-phase 2,300/230-v power transformers. The 2,300-v motors driving the ball mills, kilns and compressors were served directly from the sub-station bus. Wound-rotor motors were selected to drive the kilns, synchronous units to operate the compressors, and special type synchronous motors to run the mills. Generally speaking, the only d-c used in this project are two 75-kw motor-generator sets supplying excitation current for the synchronous motors.

Rectifier Voltage Increased

Additional power facilities required ten years ago at the chlorine plant to double productivity were handled with unusual economy. This may be directly attributed to the foresight exercised a few years previously in selecting four 1,000-kw mercury arc rectifiers and their associated transformers. By minor modifications, these rectifiers with their original output voltage of 230 were converted to 2,000-kw units. Each provided an output voltage of 550, at a substantial saving in conversion cost.

The economies obtained in this conversion were made possible by the fact that, first, the rectifiers were originally purchased with baffling for the higher voltage; and second, the

transformers specified at the outset were selected on the basis that they could be used to serve one 2,000-kw rectifier instead of two 1,000-kw units.

Two new 2,000-kw rectifiers were added, increasing the total rectifier capacity to 12,000-kw. The new units were served from the 2300-v system on a 24-ph basis to reduce harmonic disturbances to electrical and communicating systems.

The expanded electrical equipment installation for chlorine manufacture, consisting of the two new 2,000-kw rectifiers and two relocated 2,000-kw units, was served from a 2,300-v switch structure providing two separate bus sections. Each section, with its own 2,300-v feeder from the power plant, was divided, in turn, into a double bus system incorporating full selector type switching. Thus, either bus could be cleaned and new connections made at any time without interrupting service.

For switching safety on each section, bus tie breaker circuits were installed. To insure service continuity, a section tie circuit connecting the two bus sections was installed. Also, a tie circuit linking these new bus sections with the older chlorine switch structure installation was made.

This switch structure was built with steel frames having fireproof insulating material as covers and barriers. The two feeders from the powerhouse were installed in the same pattern as had been used on the other 2,300-v feeders.

Multiple Cables for Reliability

To minimize service outages resulting from cable failure, multiple cables (four single conductor 500,000 cm) were connected in parallel in each phase and were grouped with each conduit or duct containing 3 ph. When a cable fails, the particular 3-ph group in which the failure occurs is determined, the group disconnected at each end of the circuit, and the feeder restored to service at reduced capacity. Defective grouping then can be repaired or replaced with little production loss.

Standard cable used for 2,300-v feeder installations is varnished cambric-insulated, lead sheathed, with a 5,000-v rating. All cabling exposed in wire tunnels, manholes, pullboxes, or at duct ends, is covered with double thickness of ⅛" x 2" fireproofing material impregnated with sodium silicate solution.

Although at one time an emergency connection to the lines of the Cleveland Electric Illuminating Co existed, the Plant now meets all of its own electrical requirements for chemical processing and other plant needs. A new high-pressure 15,000-kw turbogenerator recently was installed with several electrical features that differ from previous practice. The new unit operates on 1,500 psi steam (from an individual pulverized coal-fired boiler), exhausting at 150 psi, and generating electrical power at 13,800-v. A hydrogen-cooled unit rated at 15,000-kw at 0.5 psi hydrogen pressure has full facilities for obtaining 150% rating by increasing the hydrogen pressure to 15 psi. This new unit has several other features that differ from previous practice.

Ground Flow Limited

To produce a phase ground indication without circuit tripping in case of a fault to ground, the wye-connected generator neutral is connected to ground through the primary winding of a single-phase transformer, of which the 440-v secondary is short-circuited through a resistor. This arrangement limits the ground flow to approximately 40 amp during a phase to ground fault on the 13.8-kv system. Installed on each 13.8-kv circuit is a relay system that indicates, through audible and visible signals, which circuit has a phase ground. Since all circuits normally operate ungrounded, this feature allows a planned shutdown of the faulted circuit instead of instantaneous tripping and its resultant confusion to production.

Until this installation, all excitation for the generators had been furnished by self-excited direct-connected exciters. But during the engineering planning of this installation, pilot excitation was considered because of the longer distribution lines radiating from the power source. The pilot exciter is eliminated in this case, since the main exciter fields are served from a 135-v nickel alkaline storage battery kept on trickle charge by two electronic battery chargers, either of which is capable of furnishing required excitation power. Switching facilities are also provided to secure excitation power from the station control battery if required. Boiler auxiliary drives, including induced and forced draft fans, are equipped with line-start squirrel-cage motors, since additional power factor correction was not required.

Switch structure for this 13.8-kv installation is of the metal-enclosed station switchgear type with the same basic design characterizing the early oil circuit breakers installation. A two-section bus is provided, arranged for connecting the generator at full capacity to either section or both. One 10,000/13,333-kva 13,800/2300-v transformer, with thermal-controlled air-blast fans, furnishes a tie from each 13.8-kv bus section to the 2,300-v synchronizing bus which functions as a tie between the three 2,300-v switch structures. A 13.8-kv circuit through a 2,500-kva 13,800/2,300-v transformer is installed from one section of the bus to a metal-clad 2,300-v switchgear installation for boiler auxiliaries. The two-section bus 13.8-kv structure allows either bus section to be taken out of service for cleaning or new connections without impairing service. Complete circuit and bus differential protection is provided.

Emergency service for this boiler auxiliary station is obtained from one of the older 2,300-v boiler auxiliary stations through automatic transfer equipment. Sufficient space is provided for future installation of one 13.8-kv feeder on each section of the new bus. Ultimately, these feeders will furnish a ring system of 13.8-kv power distribution, which will replace services to some of the present remotely located 2,300-v installations. Thus these will be available for new requirements.

It is significant that the addition of the new 15,000-kw unit to the plant system required but few changes in the original equipment. These were modernization of power plant oil circuits breakers on main bus sections installed prior to a 1939 installation. New type main contracts and faster operating mechanisms were installed on the original breakers, giving them practically the same interrupting ratings under the new standards as they had originally under prevailing standards at the time they were manufactured.

New Relay Assures Feeder Resumption After Outage

Part II

Modified phase over-current relay with inverse characteristics approaching those of a fuse demonstrated to avoid unnecessary tripout when restoration of feeder to service after diversity-losing outage is attempted

L. J. AUDLIN and M. H. PRATT, Central New York Power Corp
A. J. McCONNELL, General Electric Co

HAVING OBTAINED a record of inrush current and a record of relay action during the inrush period,* the following questions remained:

1. If the inrush current were known, could relay action be predicted within acceptable limits?

2. Can a safe relay setting be deduced, even without exact knowledge of the motor load, for an urban feeder presumably similar to the one tested?

Relay Action on Inrush

Relay action can be obtained from the relay time curves if they are carried as low as 1.1 times pickup. The result can be obtained by an integrating process which determines successively the amount of relay disk motion over small intervals of time and at multiples of pick-up current assumed to be constant during each interval. For example, with the 15-min outage curve of Fig 1, assume that about 2.3 times pick-up current remains constant for the first 0.05 sec. The ICC relay disk will travel a distance corresponding to about 0.04 lever setting.** If this process is repeated until the inrush current decreases to the pick-up setting of the relay, the total disk travel can be obtained. By this method, it was calculated that the standard inverse relay should move a total distance corresponding to 2.7 time lever (actual setting, 1.5 lever), and the ICC relay should move 0.20 time lever (actual setting, 1.75 lever). These calculated values roughly check the actual results in that the standard inverse relays closed within the inrush period, whereas the ICC relays did not. This method is applicable to checking the performance of any relay under inrush, regardless of whether or not the relay iron saturates.

If the relay iron does not saturate during the inrush period, it is possible to calculate the total disk travel more easily and perhaps more accurately by use of the following formula*:

$$XPU_1 = \sqrt{\frac{\int_0^{t_1} (XPU)^2\, dt}{t_1}}$$

Where

PU = pickup current = 1 per unit
XPU = multiple of pickup
t_1 = time at which pickup current is reached
XPU_1 = constant multiple of pickup which, if applied for same period t_1, would give same disk travel as is actually caused by variable XPU

Equation (1) will be recognized as the RMS value of XPU over the interval from $t = 0$ to $t = t_1$, and can be obtained easily in the following manner:

1. From the inrush curve, plot $(XPU)^2$ vs. t until XPU = 1 (that is, when $t = t_1$).

2. Find the area of the above curve.

3. Divide by t_1.

4. Take the square root.

Equivalent Inrush

Step 4 results in a multiple of

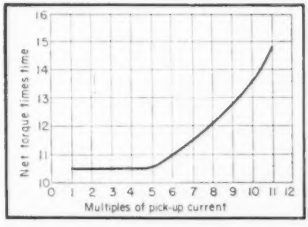


FIG 4—SATURATING characteristic of ICC relay showing saturation at 5 times pickup

* See first instalment Electrical World Sept 10, 1949, p 99.

** Obtained as follows: At 2.3 times pickup, choose the time-current curve, for the relay being checked, for any time lever setting, and record the operating time. (e. g., ICC relay, No. 3 lever setting, 3.5 seconds). In 0.05 seconds, the disk will move a distance corresponding to a lever setting of

$$\frac{0.05}{3.5} \times 3 = 0.04$$

* If it is desired to use actual current values, rather than per unit values, for XPU and XPU_1, current in amperes can be used directly in the equation.

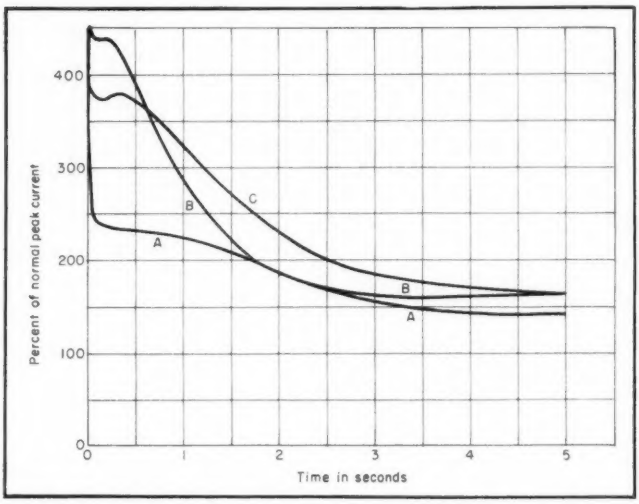


FIG 5—INRUSH CURVES based on Syracuse and other tests

pickup (XPU_1) which if applied constantly for a time t_1, would result in a disk motion exactly the same as would occur with the variable inrush current.

The ICC relay is susceptible to the above treatment since it does not begin to saturate until about 5 times pickup, a larger current than obtained during inrush. This is indicated by Fig 4, which is a plot of $t[(XPU)^2 - 1]$ vs XPU for time lever 2 of that relay. With no saturation, the product of torque and time should be a constant. Conversely, any deviation from a constant indicates saturation.

Visual Estimate Inaccurate

Using the above method, it was calculated that the ICC relay disk should move a distance corresponding to 0.20 lever on the 15-min restoral inrush. This corresponds to 0.20 lever obtained by the step-by-step method. The visual observation during the test was noted as roughly 0.6 lever. Considering the very small total contact-travel arc, a highly accurate visual estimate of a small part of this distance would have been impossible.

Several test inrush curves are shown in Fig 5 including the result of the test described herein (Curve A). Outage times associated with test curves B and C were one hour or longer. Curve B was taken during peak load conditions, while Curve C was taken during half-load conditions and replotted based on peak load. It is estimated that Curve A, even with complete loss of diversity, would not have been so severe as the longer outage, peak load Curve B of Fig 5.

Let us consider, then, the ICC relay setting which might be necessary, with an adequate factor of safety, for the inrush current of Curve B of Fig 5.

Using the second method outlined above, calculations were made of the time-lever setting necessary to just avoid contact closure. Several calculations were made, each with a different relay pickup. Figure 6 shows the resulting series of relay time curves. To compare with previous practice the inrush curve (Curve B, Fig 5) is replotted on Fig 6. However, it is apparent that the plot of inrush current, in conjunction with the relay time curves, means little, since all of the relay curves shown, and many more, are equivalent as far as the effect of inrush current is concerned.

Similar calculations were made based on Curve C of Fig 5. The results indicated that Curves B and C of Fig 5 are substantially the same in their effect on the ICC relay.

Since the time curves of Fig 6 are plotted on the basis of no margin against tripping on inrush, actual time-lever settings would be chosen to provide as much margin as possible. The combination of pick-up and time-lever settings finally chosen is obviously a compromise between sensitivity and operating time during faults.

Choice for CNYP Feeders

On the basis of this study, satisfactory operation using the ICC relay, is expected on most, if not all, feeders on the Central New York Power Corp System. Satisfactory operation includes (1) a relatively wide safety margin against tripping on inrush current following an outage, (2) a reasonably sensitive pick-up setting, and (3) acceptable operating times during faults.

It is planned to use a pick-up setting of from 1.75 to 2.5 times normal peak-load current, with time-lever settings of from 2.0 to 1.0. Fig 7 shows time curves based on these settings.

If it is assumed that an ICC relay is applied in accordance with Fig 7, and that inrush Curve B Fig 5 applies, the following margins against tripping will be obtained.

Relay Pickup in % of Normal Peak	Time Lever Setting	Contact Travel in % of Total Travel Required to Trip
175	2.0	44
200	1.5	44
250	1.0	20

The pick-up setting of the relay determines the reach of the relay during short circuits, and therefore determines the location of main or branch lines fuses or other sectionalizing devices, if these are necessary. Study has so far indicated that no main-line sectionalizing devices will be necessary on the Central New York Power Corp's feeders.

Occasional Modification

The relay settings given above may have to be modified somewhat on a specific feeder for one or more of the following reasons:

1. Fuse coordination (discussed later).

2. The use of reclosing devices in the line away from the substation. If reclosure can occur before the relay can reset, the relay time may have to be increased or, as an alternate, timers may need to be applied on the reclosing devices.

3. Reclosing at the substation. (For example, instantaneous first trip and fast reclosure, with subsequent time-delay trip.)

Investigation of all distribution feeders on the Central New York Power Corp System is now under way to determine which ones might not restore after outage with present relays. Indications up to the moment are that at least 30% of the feeders might not restore following an outage at time of peak. The new relays are already on order for a number of these feeders.

Better Coordinated Protection

A typical small 34.5-2.4-4.8-kv substation might well be, and often is, protected by 34.5-kv fuses on the primary; and reclosing, line-type fuses, with one or two timers per phase, on the secondary side of the transformer bank.

For a larger substation, a secondary oil circuit breaker would be used as the full-load-secondary current would be above the rating of the reclosing fuses. With a standard inverse relay, as shown in Fig 8, set to pick up at 200 amp, and with a time-lever setting of 1.0, the relay will very likely fail to coordinate properly with the largest fuse installed on the distribution circuit at low values of short-circuit current. At low values of short-circuit current, a certain percentage of the load current will continue to flow; and when this is added to the short-circuit current, the relay time becomes faster than the clearing time of the fuse.

The relay time with this particular time-current curve cannot be increased, in many cases, due to the long clearing times which will be obtained for faults on the substation secondary bus. If an instantaneous-overcurrent relay cannot be applied, as it could not be in this case, then not only is the coordination with the distribution line fuse poor, but, in addition, an extremely high-ampere-rated primary fuse would be required to obtain proper coordination with the secondary breaker.

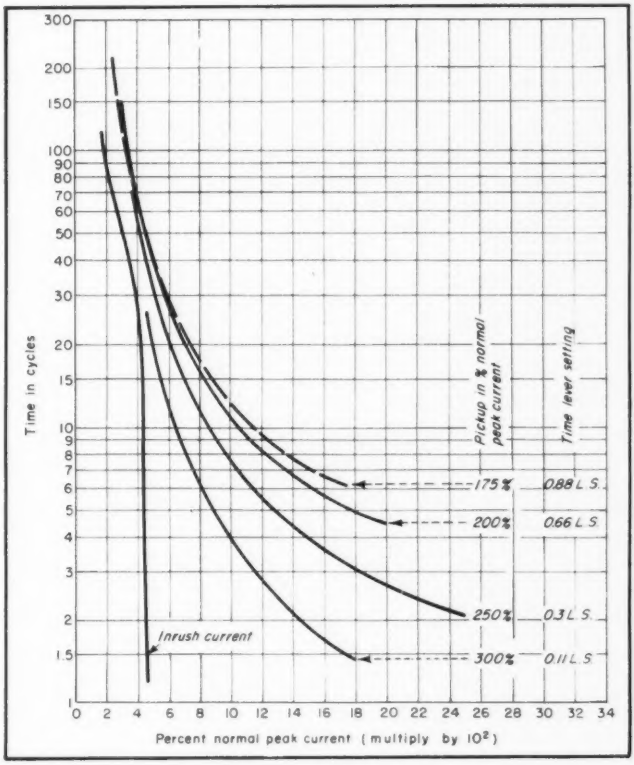


FIG 6—VARIOUS ICC relay settings which will just close contacts on the inrush currents of the middle curve B of Fig 5, plotted with no margin against tripping or inrush

Fuse Clearing Time

As it is, in the case under consideration, the relay time is 22 cycles plus 8 cycles breaker time while the average melting time of the primary fuse is 29 cycles for a calculated 3-phase fault on the 4.8-kv bus. For a phase-to-phase short circuit on this bus, the secondary clearing time will be 23 plus 8 or 31 cycles, while the average melting time of the primary fuse would be 39 cycles, and the minimum melting time would be 35 cycles. This means that the total breaker-clearing time equals 31/35 or 0.885 per unit of minimum fuse-melting time. This nearly works the safe clearing time to its limit, and, in so doing, necessitates a fuse rated at 50 amp, while the full-load current of the transformer bank is only 17.5 amp. This fuse, obviously, does not give as good protection to the transformer bank as one would with a lower ampere rating.

If relays were used having very-inverse time-current curves, then the desired time would be obtained at the lower fault current, as shown in

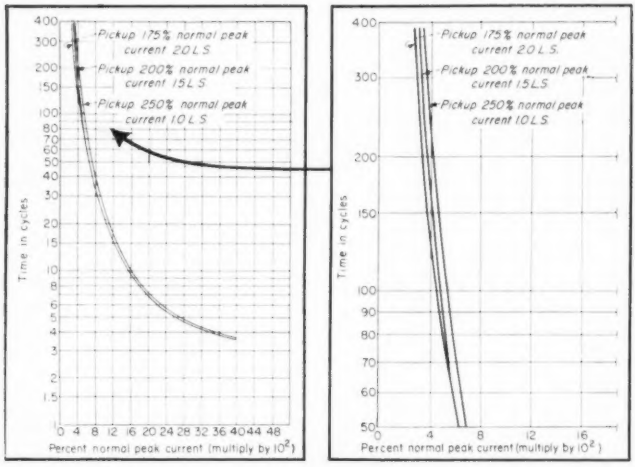

Pickup 175% normal peak current 20 L.S.
Pickup 200% normal peak current 15 L.S.
Pickup 250% normal peak current 10 L.S.
Time in cycles
Percent normal peak current (multiply by 10²)

FIG 7—PROBABLE range of settings which may apply to Central N. Y. Power Corp distribution circuits. Figure at right is detail of the curve at left

Fig 8. At the maximum 3-phase fault current, the relay time would be 16 cycles. In this case the total breaker-clearing time is then 24/27 or 0.89 per unit of minimum fuse melting time. While this relay gives us what is wanted on low fault current, and is an improvement over the standard inverse relay on the higher currents, it does not allow decrease in size of the primary fuse.

An ICC relay having an extremely inverse time-current curve, more or less paralleling the fuse time-current curve, is shown in Fig 8. If this relay is set to give the same time as the very-inverse relay on the low fault current, then for maximum 3-phase fault current, the relay time is 5 cycles plus 8 cycles breaker time or 13 cycles total time, while the average melting time of a 40-amp fuse is 19 cycles. In this case the total breaker-clearing time is 13/19 or 0.685 per unit of the average fuse melting time. The minimum fuse melting time will be 17 cycles, and the total breaker-clearing time 13/17 or 0.765 per unit of this minimum fuse melting time.

It will be seen that the ICC relay in this typical example is superior to the standard phase relay and also to the very-inverse relay. The latter relay has been applied widely as a residual ground relay on distribution circuits but has been used only to a very limited extent as a phase relay.

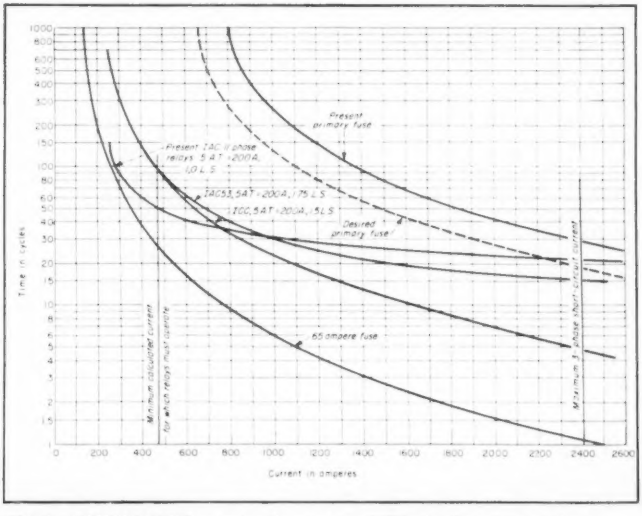

Present primary fuse
Present 3 AC II phase relays 5 AT - 200 A. 10 L.S.
3 ICC 53 5 AT - 200 A. / 7.5 L.S.
3 ICC 5 AT - 200 A. 5 L.S.
Desired primary fuse
65 ampere fuse
Minimum 3-phase short-circuit current
Minimum coordinating current for which relays must operate
Time in cycles
Current in amperes

FIG 8—COMPARATIVE protective characteristcs of ICC wth other relays and fuses

Conclusions

A relay having an inverse time-current curve more nearly approaching a fuse curve, such as the characteristic curve of the type ICC29 relay, has the following advantages when used for phase-overcurrent protection:

1. Allows the picking up of many fully-loaded distribution circuits having a large proportion of automatically controlled motor load, after a prolonged outage, with a good margin of safety, and without any sacrifice of protection against faults.

2. The relay time continually decreases as fault current increases, thereby progressively reducing the total clearing time as fault locations approach the substation. This is why the use of this relay not only does not sacrifice any required protective functions but also frequently results in even better protection.

3. Gives improved equipment protection also because of the better coordination possible with distribution fuses on low fault currents and with primary fuses on high fault currents.

Bibliography

"Motor Inrush Following Distribution Outage", E. O. Painter, ELECTRICAL WORLD, September 29, 1945, pages 78-80.

Hold-Closed

till the right fuse blows

a new concept in recloser operation!

G-E invites you to consider a different concept, the alternate operating function built into the FR-1 Recloser. Suppose a recloser, after its two instantaneous openings, HOLDS CLOSED *but only until the right fuse blows*—then automatically resets for instantaneous openings—ready to again clear temporary faults. What then?

FIRST— Fewer reclosers would be needed for complete protection. Where reclosers would ordinarily be required, you could use co-ordinating fuses instead.

SECOND— Fewer consumers would be affected by permanent faults, because the "hold-closed" function lets you use more co-ordinating fuses. You can break up a feeder into five, six or even more sections, each protected by a progressively smaller fuse. When the recloser holds-closed, it *forces* the *right fuse* to clear a permanent fault, thus confining outages to smaller areas.

THIRD— You can pick up the load after an outage without by-passing the recloser. No need to worry about inrush and motor starting currents because the recloser can't lock open—it holds closed, picks up the load, then automatically resets to normal position.

General Electric believes that on rural lines, this "hold-closed" function is the answer to lower cost protection, fewer outages per consumer and faster service restoration. Therefore, its new recloser, the FR-1, has been designed to embody this exclusive "hold-closed" function. Conversion from conventional operating function to "hold-closed" function can be made in the field. With this "hold-closed" function, the recloser opens twice instantaneously, each opening followed by a 1-second reclosing. This clears non-persistent fault without damage to fuses. If the fault is persistent, the recloser then *holds closed*—but only long enough for the fuse to blow and clear the fault—whereupon the recloser quickly resets, ready to go again.

The FR-1 recloser can also be used with the conventional operating function—two instantaneous openings, plus two time-delay openings, to lock open. Because the time-delay openings are controlled by a highly accurate mechanical-escapement timer, operating in air, the FR-1 is not affected by temperature or condition of oil—thus permitting *reliable* year-round co-ordination with more ratings of fuses than any other conventional lock-open type of recloser. Because the FR-1 resets 5 times faster it gives more protection.

For the full story on the new "hold-closed" function, including complete application information, write for Bulletin GER-131. *Apparatus Department, General Electric Company, Schenectady 5, New York.*

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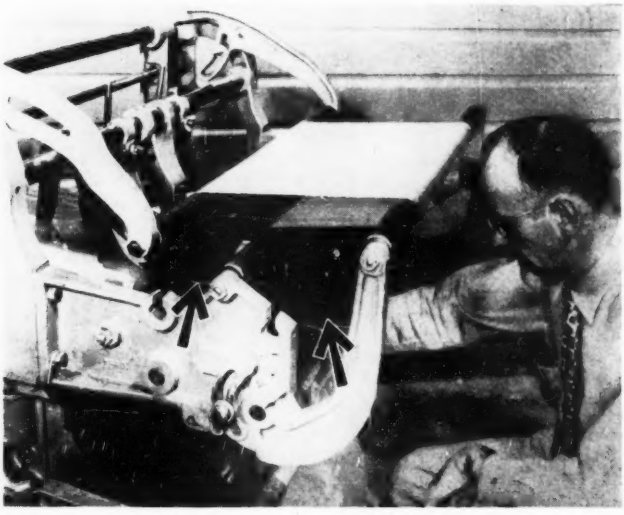
HOW TO DESIGN • CONSTRUCT OPERATE • MAINTAIN

Photo Electric Control Gives Cutting Accuracy



PAPER BAGS are fabricated uniformly with register control (arrows) for cutting mechanism and printing to insure correct location of the label on each bag

A ONE-WAY CUTOFF register control in a Simplex wrapping machine is enabling the Granny Goose Foods Co. Oakland, Calif., to uniformly fabricate either large or small transparent bags at the rate of over 80 per min.

The machine is completely automatic except for unloading the finished bags from the receiving trough. By direct light transmission the General Electric cutoff register control makes sure that the cutting mechanism accurately lines up with register marks on the printed material, thus keeping the bags uniform with the label correctly located on each bag.

The light source and scanning head of the register control are mounted so that the register marks can be "seen" by photoelectric method. If the scanning head does not "see" the register mark, a signal is sent to the correction mechanism to bring the paper back into the register.

How to Organize Load Tests on Distribution Transformers—II

MEASUREMENT of maximum demand on distribution transformers with and without temperature indicators and a schedule for the operation was outlined in EW, August 27, 1948, page 96.

Where a transformer or bank serves one customer only and that customer has a maximum demand indicator as a regular feature of his installation's metering, the maximum demand may be determined from the meter reading records and the routine measurements may be omitted. In such cases the company's maintenance supervisor causes the corresponding meter reading slips to be examined annually during September, and the maximum demand for the preceding year to be recorded. Maximum demands are measured with a suitable time-lagged indicating instrument. This is left in circuit for at least 24 hours which must include the full load period. Each time the demand measurement is taken temperature indicator is read and, if necessary, reset.

Temperature Indicators

Transformers in vaults are equipped with temperature indicators if the maintenance supervisor so decides. Where two or more transformers are installed in multiple or in the three-phase bank an indicator is installed in one of these, preferably that which will be operated at the highest temperature.

The maintenance supervisor causes graphic ammeter tests and others of like nature to be made wherever desirable to provide complete information on the loading of the distribution transformers. The meter department assists in such tests as may be required. If a transformer is found to be loaded to its rating or above, but not enough to require changing, a red clip of the "Smith Signal" type is attached to its load record to insure close watching. In general, overhead type single-phase transformers are changed to a larger size when the load has reached, or appears likely to reach, 150% of its kva rating, or 105% of rating with the subway

The a-c secondary network system is now recognized as the lowest-cost system for providing high-quality service to heavy load areas. While normally used for business sections of cities—50,000 or more in population—it will frequently pay its way in smaller towns as well.

But—to realize the full savings possible with networks, you should use standardized network equipment. For example:

YOU SAVE ON INSTALLATION when you specify

Standardized Network Equipment

NARROWER VAULTS—With widths of 4½ feet or less, vaults can almost always be built between building line and curb—the best location from the standpoints of real estate, construction, and servicing. The problem of roof-slab construction is appreciably reduced. Complete servicing can be carried out from the two ends where all accessories and connections are grouped.

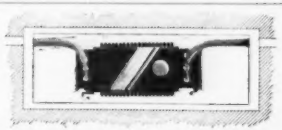
SHALLOWER VAULTS—One to two feet less depth permits substantial savings in excavating and construction costs. Vault drainage is also simplified—though both the vault-type and the subway-type transformer will operate without damage even if completely submerged. High-and low-voltage terminals are well below transformer top—providing room for large-radius cable bends.

PLUS

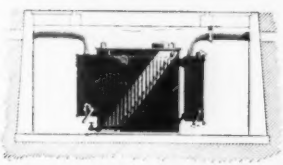
FASTER DELIVERY—G-E standardized network transformers and protectors can be supplied on shorter delivery.

LOWER PRICE—The cost reductions due to repetitive manufacture are passed on to you in the form of lower prices.

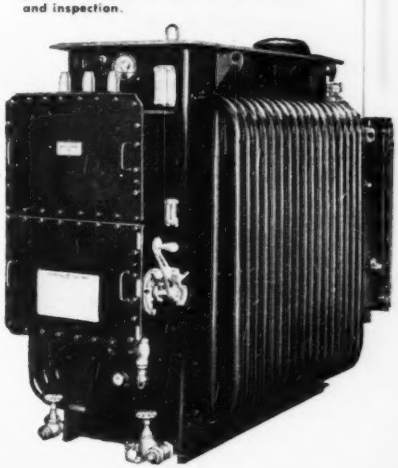
LESS MAINTENANCE—G-E standardized network units have welded construction that eliminates major gaskets. Accessories are conveniently grouped at the high-voltage end. Network protector with plug in relays slides out on rails for quick inspection.



With manhole openings at both ends, vault need be only 14′ long, 4½′ wide for 500-kva transformers.



A clear depth of 7′ below roof slab will provide sufficient room for maintenance and inspection.



Ask your G-E representative or write to Apparatus Dept., General Electric Company, Schenectady 5, N. Y. for full information on standardized network equipment. Bulletin GEA-5024 describes network transformers; GEA-2017, network protectors.

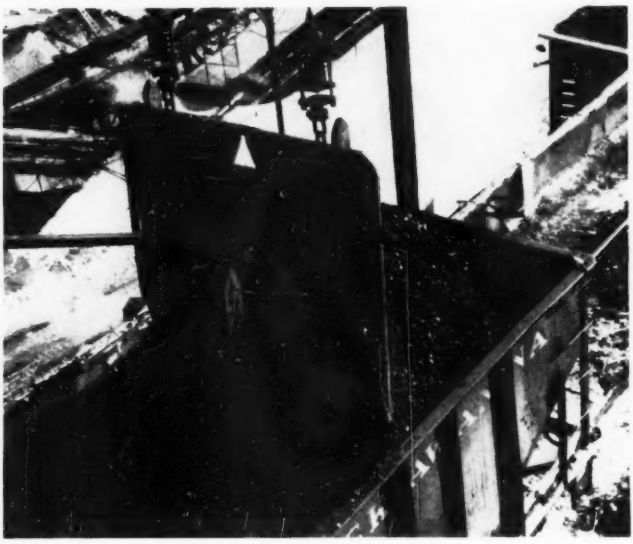
GENERAL ELECTRIC

402-78

types or 3-phase units on banks.

In every case where a transformer is burned out, the maintenance supervisor is required to cause the transformer replacing it to be measured for maximum demand, unless the cause of the burnout is clearly obvious. Such tests are made by a maximum demand meter over a period of at least two days, and are required to be started as soon as possible after the burnout occurs.

Slice Bar Increased Coal Car Unloading Rate



SLICE BAR operated by overhead crane decreased unloading time for coal cars

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Superintendent, Gas Manufacture
Rochester Gas & Electric Corp
Rochester, N. Y.

By the use of a slice bar, the rate of unloading coal from hopper cars has increased to almost 240% compared to the previous "bucket" method or almost 400% compared to the manual method. Approximately 25 cars or 1300 tons of coal a day must be unloaded and prepared for the manufacture of coal gas and coke at the West Station in Rochester. Due to limited plant storage facilities, that quantity of coal must be unloaded every day of the year regardless of weather. The coal is washed at the mines and although is is dried to some extent, it is still quite wet, which makes unloading more difficult particularly in winter weather when the coal is frozen.

The slice bar is a 3-ton steel plate which "pokes" the coal through the opened car doors. In addition it is used to clean the bottom of the car so that very little, if any, hand cleaning is necessary.

Operation of the bar by an overhead crane provides for maximum safety in comparison to being handled previously by a derrick with an operator's cab on ground level. The crane was installed in time to be used during the severe weather conditions through the winter of 1944-1945. At approximately the same time heating pits were installed to thaw frozen coal in the hopper bottoms. The heating pits are refractory lined chambers installed between and below the tracks. These pits are heated by gas burners and are so placed that the hoppers on two cars may be thawed simultaneously.

Since the slice bar and crane were installed the coal unloading rate has been as much as 47.5 tons per manhour. As a comparison, prior to 1935 the rate was 12 tons per manhour average for summer and winter operations. At that time men climbed on top and pushed the coal through open doors, then used shovels and sometimes picks to remove the remaining coal.

In 1935 the unloading rate increased to approximately 20 tons per manhour after a derrick and a standard clam shell bucket were installed. The loaded bucket was dropped on top the coal to eliminate the hand poking. But shoveling and pick work inside the car were necessary after the bulk of coal had been removed despite loosening with the bucket.

Kit Aids in Studying Cable Sheath Corrosion

Migrating cable sheath corrosion due to concentration cells required a duct survey. The survey was made with the aid of a test kit (see illustration) designed for the purpose. The investigation was necessary when a cable failed after three years of service. The cable was found to be severely corroded near one end of the length.

L. F. GREVE
Corrosion Engineer
Commonwealth Edison Co
Chicago, Ill.

A routine test in this case indicated electrolysis conditions were satisfactory. However, the duct survey made along the length of the conduit showed the sheath to be positive to the earth for a portion of the length.

The survey consisted of taking a series of voltage and leakage current readings at 4-ft intervals along the

what's **New** in street lighting

Now every single film cutout individually tested

Ever install a new film cutout and find it shorted when the current went on? You probably have, if you operate series street-lighting circuits. And if your experience is like most, the short in that 3½¢ cutout cost you many dollars to correct.

TO SAVE YOU MONEY

Now General Electric has developed, and installed in its production line, an automatic tester which actually tests each film cutout for shorts and insulation values—individually—before it is packaged.

Starting with cutouts that are known for the accuracy of breakdown, that are obtainable in the right rating for the right lamp, and that are designed to operate under high temperature and pressure conditions, G.E. has produced even a better film cutout without any increase in price.

Individually tested film cutouts are another example of General Electric's policy—making the best, first. Next time you order cutouts, specify General Electric and save yourself time and money. *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*

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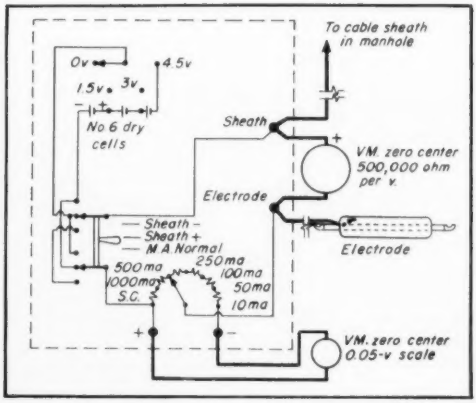


Duct Survey Kit

ABOVE—CONNECTION DIAGRAM shows two voltmeters used with a standard lead electrode and through No. 6 dry cells

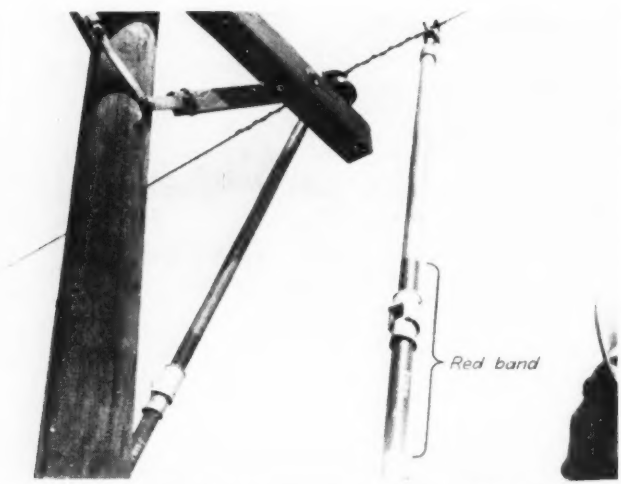
LEFT—TEST KIT contains dry cells, resistances, switches and binding posts. Kit also can be used to determine anodic and cathodic condition

duct between the cable sheaths in the manholes and an electrode pushed into a vacant duct.

Equipment used in the survey included a kit containing dry cells, resistances, switches and binding posts. As shown in the diagram, two voltmeters are used with the test kit and with a standard lead electrode. The d-c potential between the cable sheaths and the electrode, and the leakage current is indicated by the meters. Resistances may be calculated from the readings recorded. The same equipment is also used to determine both anodic and cathodic conditions due to stray railway currents.

Details covering the test and methods of eliminating the positive condition will be outlined in an ensuing issue.

Danger Band on Hot Sticks Keeps Linemen at Safe Distance



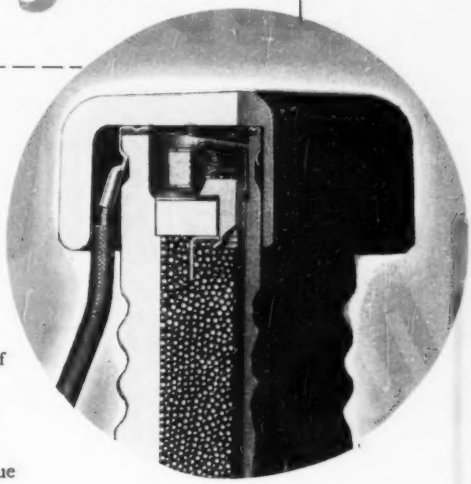
HOT STICK with the danger sign is demonstrated by Lineman Floyd Serene of the Ottawa District office of Kansas City Power & Light Co. Band thickness depends on working voltage

TWO-FT. RED BANDS have been painted on 8-ft hot sticks of Kansas City Power and Light Co to warn linemen when they inch up too far on the stick. When a man is working on a difficult job, and inching up on the stick will make it easier, he is sorely tempted to get too close. Then too, under such conditions it is difficult to judge distances. This is doubly true of the foreman who is standing on the ground. He can't always tell when the lineman is getting too close.

Red bands on hot sticks serve as warning signs to both linemen and foremen to tell them when the lineman is getting too close. They help to keep men 5 ft away from "hot stuff" on 70-kv circuits, lesser distances on sticks used on lower voltage circuits. Also, the red bands are painted narrower on the shorter sticks.

Sealed-in Nitrogen

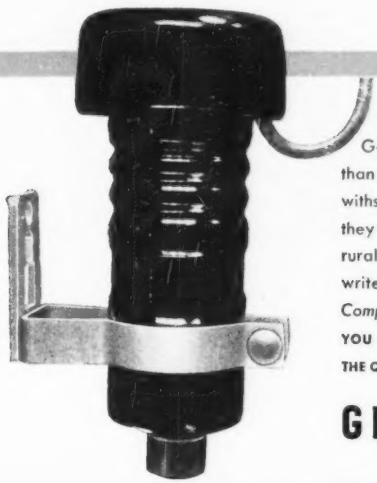
—one big reason why users prefer Pellet Arresters



Section of 3-kv pellet arrester, showing sealed N_2-filled gap chamber containing the series gap elements.

The G-E Pellet Arrester is the *only* distribution lightning arrester made today with dry nitrogen (N_2) sealed in the gap chamber. It's an ***exclusive*** G-E feature and your assurance of greater reliability over more years of operation. By preventing the formation of ozones and oxides, the dry, inert nitrogen keeps gap-electrodes bright as new and also stabilizes low sparkover characteristics.

G-E Pellet arresters are also distinguished by their unique valve material—lead dioxide pellets—which provides valve-action with ***exceptionally low*** IR drop—and which is unaffected by atmospheric moisture, condensation or humidity. These are reasons why the excellent protective characteristics of Pellet arresters ***stay*** excellent.



G-E Pellet Arresters limit lightning voltages to lower levels than any other distribution arrester—all ratings will easily withstand the AIEE-NEMA standard 65,000-ampere test—and they are applicable on *any* distribution system, urban or rural. For further details see your nearest G-E dealer or write for Bulletin GEA-2975. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

YOU BUY *BETTER* PROTECTION WHEN YOU BUY *PELLET* ARRESTERS!
THE QUALITY-STANDARD OF THE INDUSTRY FOR MORE THAN 25 YEARS

GENERAL ELECTRIC

BUILDING LIGHTING LOAD FOR YOU! With a great

G.E.'s BIG ANTI-DRIVE - SEPT

NATIONWIDE CAMPAIGN WILL PRE-SELL YOUR CUSTOMERS

Millions of customer impressions will be created by all these ads in Life, Oct. 17; This Week, Oct. 2; Look, Oct. 25; Parade, Sept. 11, Oct. 30; American Weekly, Sept. 18, Oct. 30; Post, Oct. 8. And watch for lamp-selling messages on the Fred Waring Show every Sunday night on CBS television.

LAMPS

Stock up! Tie in! Cash in!

promotion of the greatest lamp-selling theme of all!

BULBSNATCHING

19 TO OCT 31

SPECIAL DISPLAYS HELP DEALERS TIE IN

These are the colorful, hard-selling displays now in the stores of G-E lamp agents everywhere. Featuring the famous G-E 4-lamp package, they're designed to build wider use of higher wattage bulbs, fill empty sockets throughout your area. Your lighting load will get a big boost from "BULBSNATCHING"—greatest lamp-selling theme of all!

GENERAL ELECTRIC

Power Nomograph

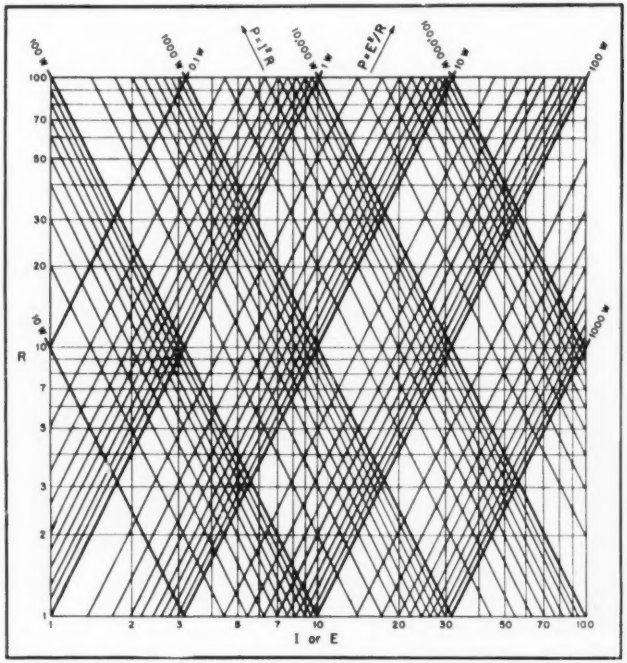
Accompanying power nomograph serves as a handy reference chart for a-c and d-c calculations. It represents the solution of the two power equations: P = I²R and P = E²/R

JOSEPH ZELLE
Technical Staff, Station WERE
Cleveland Broadcasting, Inc
Cleveland, Ohio

All scale points are plotted logarithmically. At the top an arrow with the respective slope indicates the equation that applies. Unity power factor is assumed in the a-c calculations, although apparent power can also be read from this chart.

The point at which the three lines of the nomograph meet, that of power, resistance, and either voltage or current, represents the complete solution of that particular equation. Therefore, given two parameters, the third can be quickly determined. Furthermore, with one equation solved, the known values can be transferred to the other slope, yielding instantly the unknown of the second equation.

Where the value of any given parameter should fall off scale, the original equation can be re-arranged by resorting to scientific notation. This will result in an additional factor whose product with the answer obtained from the graph will yield the actual value of the problem.



EQUATIONS P = I²R and P = E²/R can be solved by following along sloped line from coordinate point I or E, R. Sloped line applicable to power equation used is shown by arrow at top

Example

For example, suppose a circuit contains 15 ohms and 200 amp. What will be the power dissipated? Obviously 200 amp will not be found on the graph, making the chart useless in this instance. However, by using exponents of 10,

$$P = I^2R = 200^2 \times 15$$
$$= (2 \times 10^2)^2 \times 15 = 2^2 \times 15 \times 10^4.$$

In the new form of the equation, the current is 2 amp while the resistance remains 15 ohms. It is a simple matter now to locate the R (= 15) and I (= 2) coordinates, yielding 60 w on the graph. But a factor of 10^4 remains to be used. Hence the wattage of the 15-ohm circuit with 200 amp will be 60 w times 10^4 equal to 600,000 w.

To determine the voltage of this circuit, trace the 15-ohm coordinate across to the right until the 60-w slope of the other equation intersects it. Read the voltage as 30 v. But we have a factor of 10^4 and since $E = \sqrt{P R}$, the square root of the factor must be taken in this conversion. Therefore the voltage of this circuit will be $\sqrt{10^4} \times 30$, or 3,000 v.

Looked at in another way, 30 v would be the value if the current was only 2 amp, whereas 100 times more current is actually flowing in the circuit. Therefore there must be 100 times more voltage, or $30 \times 100 = 3{,}000$ v. Checking the answers in longhand we get 600 kw with both equations.

The chart should be used only for approximate rapid estimates. Answers demanded by precise laboratory measurements would have to be obtained in the more conventional exact ways. On the other hand, the chart can serve as a check for the answers calculated.

MOLONEY

LOAD CENTER TYPE UNIT SUBSTATIONS

SAFETY

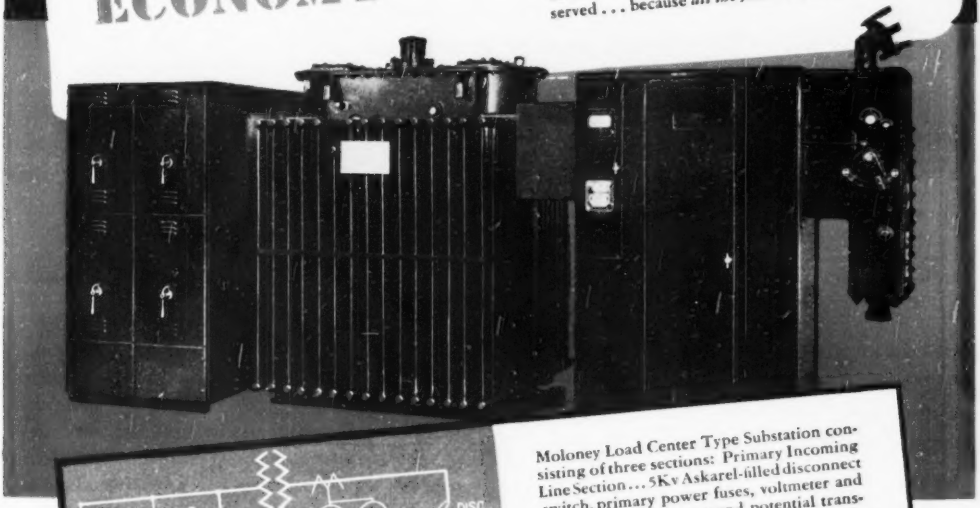
Live parts completely enclosed. No fire hazard. Transformers and primary switches Askarel or air insulated permitting indoor location without need for fireproof vault. Where primary switches are exciting current break type, interlocks prevent operation without first tripping secondary breakers.

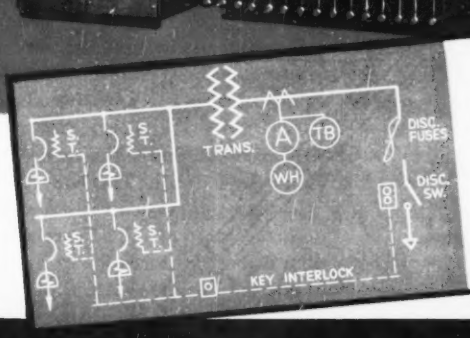
CONVENIENCE

Unit construction incorporating primary switch, transformer, and secondary air circuit breakers simplifies installation and operation. Indoor location and easy access to parts permits convenient inspection and maintenance. Unit substations can be supplied with primary air circuit breakers, selector switches, load break switches, power fuses, metering equipment or any other necessary features.

ECONOMY

Locating substation at center of load, indoors, eliminates long runs of expensive secondary copper. Better regulation increases voltage at points of use and heightens the efficiency of equipment served . . . because *all the power is put to work!*





Moloney Load Center Type Substation consisting of three sections: Primary Incoming Line Section . . . 5Kv Askarel-filled disconnect switch, primary power fuses, voltmeter and watthour with current and potential transformers. Transformer Section . . . 300 Kva, 3-phase 60 cycle, Moloney Askarel cooled transformer, 4160Y to 480 volts. Secondary Switch Gear Section . . . Four feeder Air Circuit Breakers of 25,000 amperes interrupting capacity.

MOLONEY ELECTRIC CO. ☆ ST. LOUIS 20, MO.

BRANCH OFFICES IN ALL PRINCIPAL CITIES

Rock Anchors for Guy Wires

Adaptation from construction methods of Pacific Power and Light Co, Portland, Oregon

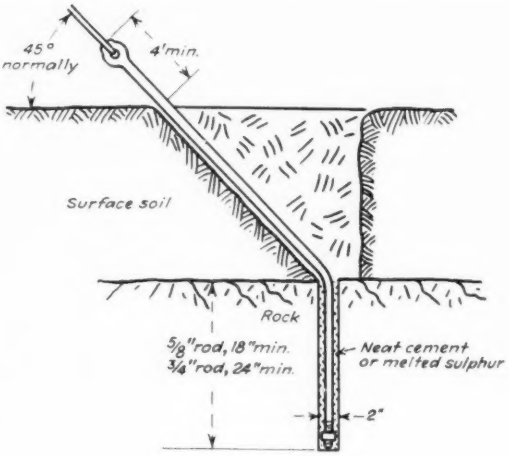


FIG 1 — STANDARD ANCHOR ROD
Ratings: 5/8-in. rod, 10,000 lb; 3/4-in. rod, 15,000 lb

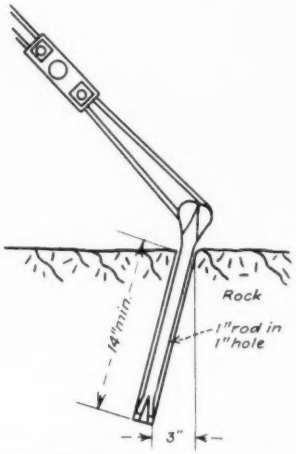
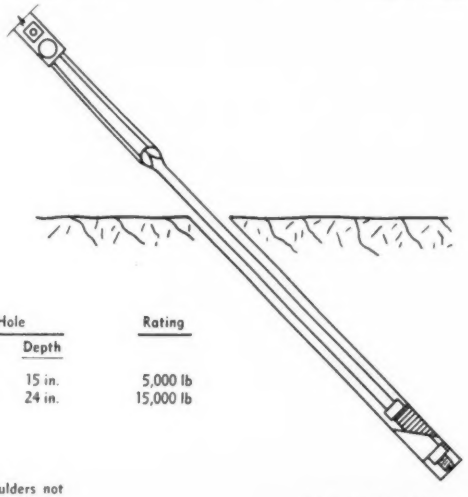


FIG 2 — THIMBLE-EYE BOLT AND WEDGE
Rating: 15,000 lb



Rod		Hole		Rating
Diam	Length	Diam	Depth	
1/2 in.	20 in.	1 1/2 in.	15 in.	5,000 lb
3/4 in.	30 in.	2 in.	24 in.	15,000 lb

Note: Anchors may be used in boulders not less than 5 ft in three 90-deg directions.

FIG 3 — EXPANDING ROCK ANCHOR

GULFCREST OIL

New 60,000 kw steam turbine recently installed at Plant Atkinson of the Georgia Power Company, Atlanta, Ga.

Another big turbine gets the safe, sure, long-lasting protection of Gulfcrest, the world's finest turbine oil!

Another case, too, where outstanding performance in other turbines operated by the same utility led to the selection of Gulfcrest Oil for the new unit!

Extra refining makes the difference! After the carefully selected crude oil used in Gulfcrest goes through the major refining methods, it is then supperrefined by the Alchlor Process.

More than 15 per cent of the oil is discarded by the Alchlor Process—this 15 per cent contains the hydrocarbons most apt to oxidize and form sludge, emulsifiers, and harmful acids.

That's why Gulfcrest is incomparably pure—why it gives outstanding performance, and lasts indefinitely. Send the coupon below for a booklet which gives you the complete facts on this superior oil.

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Please send me, without obligation, a copy of your booklet "Gulfcrest Oil for Steam Turbine Lubrication."

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Weld Brackets to Heater and Save Repair Time

STEEL BRACKETS (one shown suspending chain fall) were welded onto feedwater heaters to facilitate clamp and cover removal during maintenance work

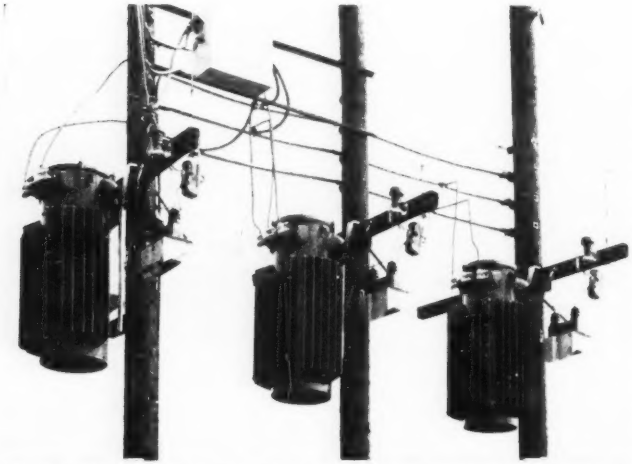
STEEL BRACKETS welded onto four feedwater heaters facilitate clamp and cover removals and reduce working time involved in making repairs. The result was accomplished through an idea advanced by Joseph T. Smith, a mechanic at Hell Gate generating station of Consolidated Edison Co of New York Inc.

Previously chain falls and cables had to be hung at a considerable height above the operating level of the heaters. That operation was necessary to remove the clamps and covers whenever repairs or plugging of leaky heater tubes were required. The steel covers are circular, 6 in. thick, 42 in. dia and located near bottom of the heaters.

On the first modified installation, brackets were welded in place at four points on the heater shell to accommodate four chain falls. That resulted in a saving of approximately 16 manhours during an outage.

Similar brackets have been installed on the three remaining heaters. Plans are made to re-tube or replace these heaters in the near future. The use of the brackets should result in substantial savings.

Pole Transformer Bank Uses No Platform



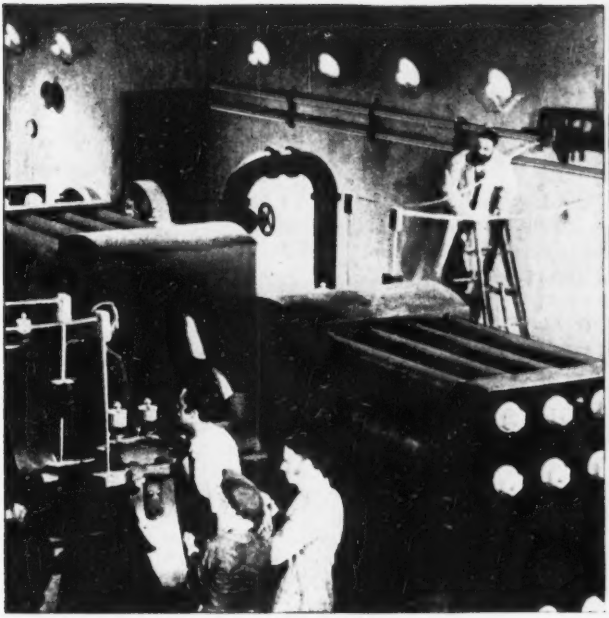
TRANSFORMER BANK installed with each transformer mounted on a separate pole for convenience and safety. A damaged transformer can be replaced with a portable spare

F. W. CHAPMAN
Superintendent, Municipal Utilities
Greenwood, S. C.

INSTALLATION of a transformer bank was made with each transformer mounted on a separate pole instead of on the usual platform between poles. Accompanying illustration shows the installation of three 100-kva, single-phase transformers connected 4160-v, 4-w wye primary, 240-v delta, 4-w secondary.

Three Poles Found Safe

Use of three poles is found to be a safe as well as a convenient arrangement. By this method a damaged transformer can be replaced with a minimum of danger and by using a portable spare no interruption to service is necessary. To provide rigidity, all three poles are bolted



BARS require minimum space, may be bent or twisted, connected to apparatus without special joint preparation and in laminated construction have unlimited d.c. capacity.

TUBES provide the highest bus conductor efficiency at a.c. frequencies, have greater rigidity, and may be oil or water cooled.

CHANNELS have large surface area, reduce temperature rise, provide greater rigidity than tubes for long runs and have flat surfaces for tap-off.

ANGLES for ventilated hollow busses have highest rate of heat dissipation, handle greater current density, but require more space for installation.

CABLES solve many problems in conducting extremely heavy currents in confined space or in connecting moving apparatus such as furnaces of the arc or resistance types.

Turning on the current at the first central station, from the Consolidated Edison film, "How Tom Edison Brought the New Light to New York."

FROM FIRST.....TO LAST

COPPER is the Best Conductor

THE WORLD'S FIRST BUS BARS, to distribute the world's first commercial electric current from Thomas Edison's Pearl Street Station in 1882, were furnished by the Ansonia Brass and Copper Company, a founding constituent of The American Brass Company. And it was the same company that paid the first electric light bill ever rendered.

Since that day, the original plain, light copper strips and rods, have been succeeded by continually improved bus conductors. In the early 90's the Coe Brass Company, another American Brass constituent, and the Ansonia Brass and Copper Company began cutting bus bars from rolled copper plates and then cold-drawing them to finished dimensions.

As electrical loads became heavier, and required more complex bus structures, the Coe Brass Company, which had been using extrusion presses to form intricate shapes of large cross-section, applied this equipment to the fabrication of heavier bus shapes, in the form of angles and channels.

With each succeeding advance in design of electrical generating and transmitting equipment, The American Brass Company has kept pace in creating and manufacturing new types of bus sections of copper, then and now the most satisfactory material for that purpose.

ANACONDA

Anaconda

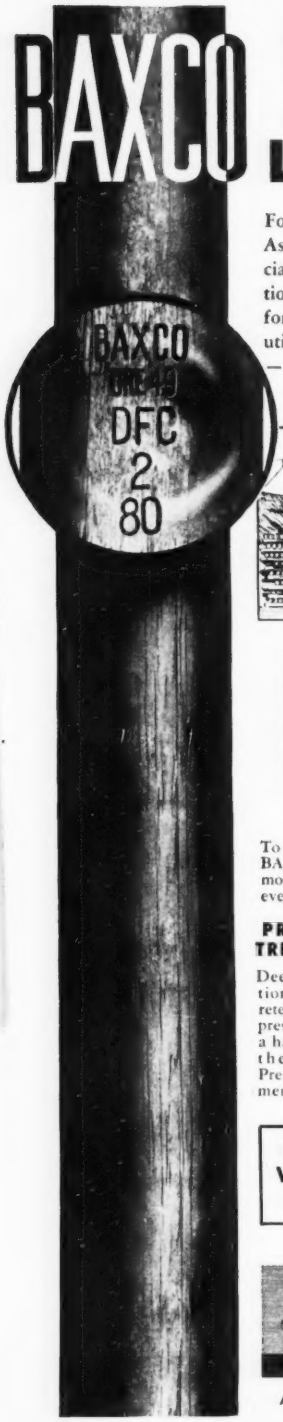
BUS CONDUCTORS

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut

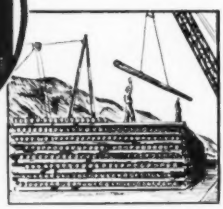
Subsidiary of Anaconda Copper Mining Company

In Canada: ANACONDA AMERICAN BRASS LTD.
New Toronto, Ont.



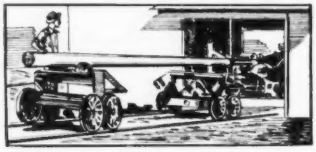
BAXCO LONG-LIFE DOUGLAS FIR PRESSURE TREATED LONG POLES

For over 50 years J. H. Baxter & Co. with its Associated Pacific Coast Companies has specialized in the production and sale of exceptionally long (up to 125 feet) Wood Poles for the electric power, lighting and telephone utilities . . . Stocks in all lengths are complete — shipments prompt!



PROPER SEASONING

BAXCO poles are carefully seasoned in dry, clean yards. Proper pre-conditioning before Pressure Treatment adds years of longer life.

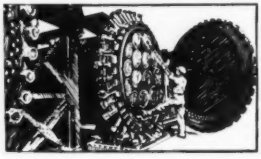


MACHINE SHAVING

To produce smoother and more uniform poles, the BAXCO process includes machine shaving. This removes small swells and results in a more round, evenly tapered product.

PRESSURE TREATMENT

Deep penetration and high retention of the preservative is a hallmark of the BAXCO Pressure Treatment Method.



Get the Full Story! Write today for this BAXCO BOOKLET

J.H. Baxter & Co.

333 MONTGOMERY STREET - SAN FRANCISCO 4, CALIFORNIA

ASSOCIATED COMPANY: J. H. BAXTER & CO. OF OREGON

near the top to the same tie strip. A lightning arrester, cutout and capacitor are mounted adjacent to the respective transformer.

Tandem Drive Saves Investment

CONSIDERABLE EXPENSE was saved in additional equipment investment by using a synchronous motor and an induction motor on the same shaft to drive a brick machine.

The Burns Brick Co, Macon, Ga., in process of modernizing their entire plant and changing from steam engine drive to purchased power, decided to use the engine driven alternators as synchronous motors. Considerable expense would have been involved to give the alternators sufficient starting torque to start even the idler shafting.

The ingenious scheme developed by Georgia Power Co engineers was to connect a 20-hp squirrel cage motor to the same shaft with the old 200 hp alternator to pull a 200-hp load. This made it possible to start the entire assembly with the small 20-hp motor.

After bringing it up to synchronous speed, the old alternator (operating as a synchronous motor) was then connected to the electric lines, the clutch closed and the load placed on the machine.

Trick in V-Belt Drive

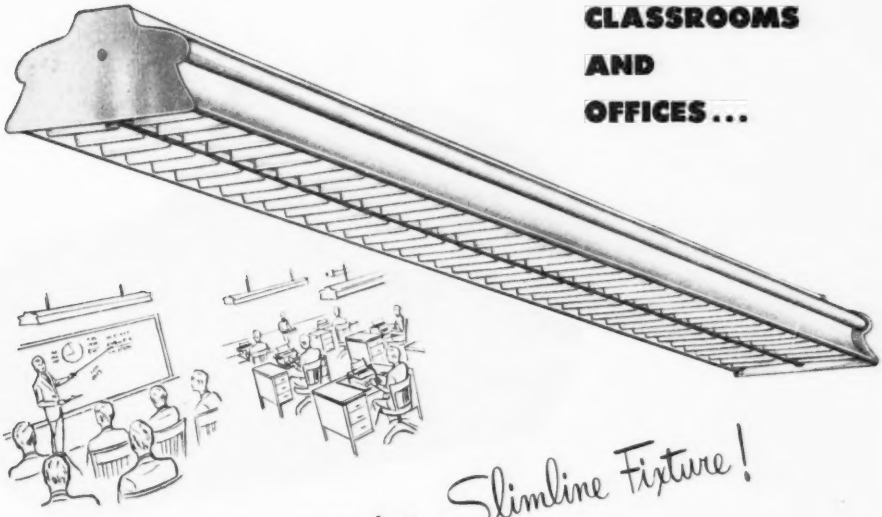
The trick in this arrangement was to have the V-belt drive from the 20-hp motor designed so that under full machine load conditions, with the synchronous motor operating at synchronous speed, the squirrel cage motor would be operating at near full load slip.

This arrangement worked so well that a similar combination was used connecting a 40-hp motor combined with a 150-hp synchronous motor (old alternator) to drive a brick machine, with the load dividing between the two motors according to their sizes. This arrangement is operating satisfactorily.

By using the small motor to start the shafting and to bring the synchronous motor to speed, the shaft clutch could then be closed to operate the brick machine. This arrangement saved the purchase of a higher rated motor with additional power factor corrections.

PUT THIS NEW "Ocular Comfort"

INTO CLASSROOMS AND OFFICES...



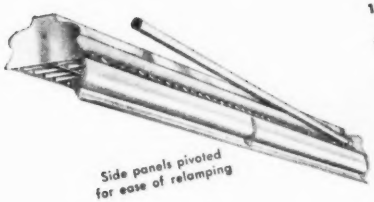
it's the latest Wheeler Slimline Fixture!

NOW you can get eight outstanding fixture features, all in one new Slimline Fixture. Wheeler's "Ocular Comfort" represents the accumulated design and engineering skill of almost 70 years in the specialized manufacture of lighting equipment. It meets a demand for:

1. **All metal construction** ... *no glass or plastics ... nothing to break or distort*
2. **Indirectly-illuminated side panels** *of smooth metal ... easily cleaned — no dirt-catching perforations*
3. **Low surface brightness**
4. **Pivoting side panels** ... *for ease of relamping (see illustration at left)*
5. **One-piece bottom louver** ... *never needs to be disturbed except for access to operating equipment*
6. **Better-than-average shielding** ... *35° both crosswise and lengthwise of fixture*

7-8. Pleasing appearance *plus high efficiency*

"Ocular Comfort" Slimline Fluorescent Fixtures are made for use with the 75 watt, 96" T12 Slimline lamp and the 40 watt 48" T12 single pin lamp. Both lamps instant-starting type. Lampholders—depressable type. Be sure to get all the details of this new product of Wheeler "Skilled Lighting". Write, *Wheeler Reflector Company, 275 Congress St., Boston 10, Mass.* ... also New York, N. Y. Representatives in principal cities.



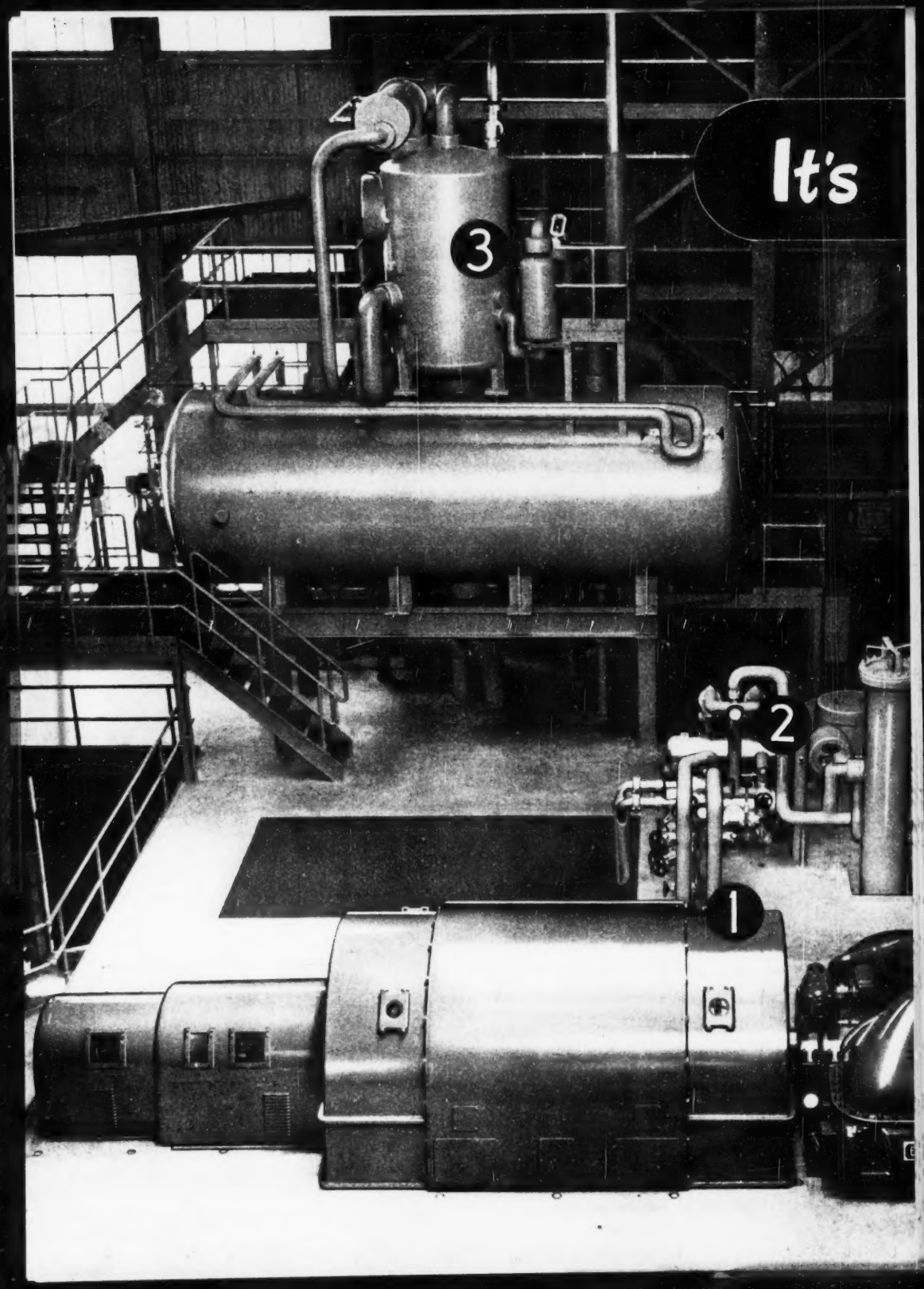
Side panels pivoted for ease of relamping

Distributed Exclusively through Electrical Wholesalers

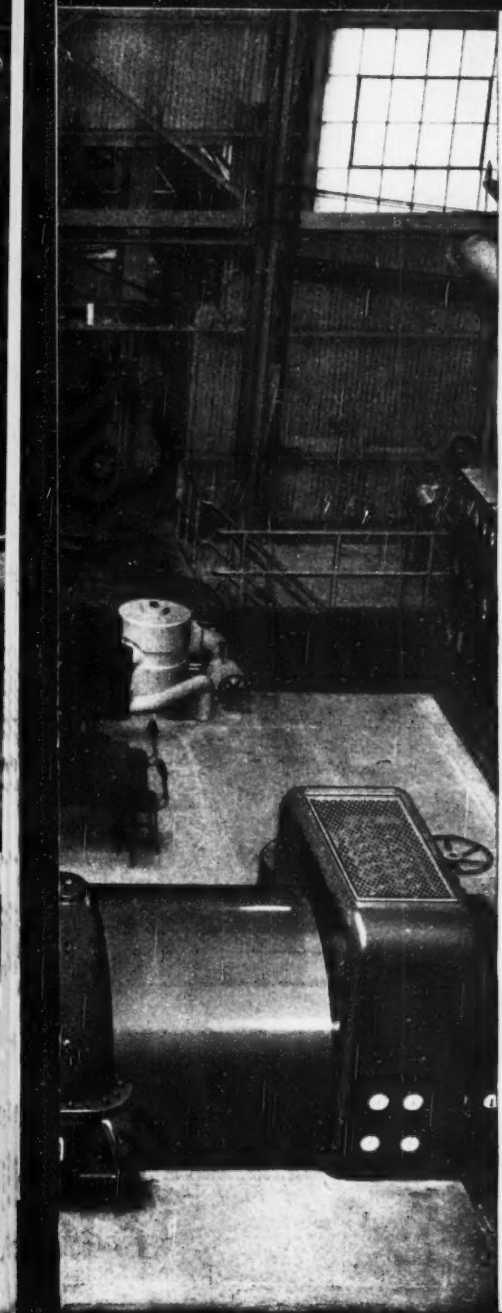
Wheeler REFLECTORS

"SKILLED LIGHTING"

MADE BY SPECIALISTS IN LIGHTING EQUIPMENT SINCE 1881


It's
3
2
1

Elliott wherever you look



❶ In the foreground, an Elliott turbine-generator unit — clean-lined, businesslike, and all-Elliott throughout . . .

❷ Just back of the turbine-generator, an Elliott twin two-stage steam jet ejector which serves the Elliott surface condenser under the main turbine . . .

❸ In the background, the Elliott vertical deaerating feedwater heater mounted on its horizontal storage tanks, unsleeping sentinel against corrosive elements in the boiler feedwater . . .

And not shown in the photo, but definitely in the picture of operating economy, is an Elliott evaporator preheater quietly and faithfully performing its function.

This plant, generating at 13.8 kv, with 600 psi, 825 F steam conditions, is typical of a score of utility installations where Elliott equipment has gone into service recently.

Here is team-work at its best. You'll find it wherever Elliott equipment gets together.

Complete data on any of this equipment mailed at your request.

ELLIOTT COMPANY

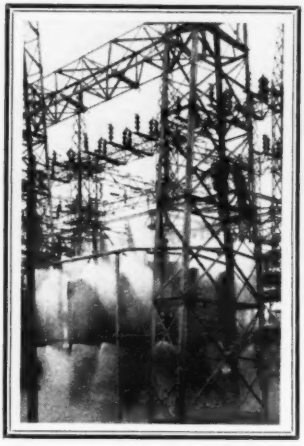
Plants at: JEANNETTE, PA. • RIDGWAY, PA.
SPRINGFIELD, O. • NEWARK, N. J.

DISTRICT OFFICES IN PRINCIPAL CITIES

Q-1143

USE SMOTHERING FOG TO

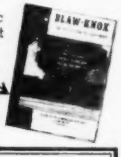
STOP TRANSFORMER FIRES



When temperature in an overheated transformer approaches the danger point, a Blaw-Knox Fire Protection System throws a curtain of smothering fog about it automatically, lowering the temperature and minimizing the danger of fire.

Even if fire does break out, it is isolated and controlled immediately and other transformers, switch gear, and nearby structures are saved.

Blaw-Knox Automatic Fog Systems* protect transformers!



ASK FOR BULLETIN No. 2207

STANDARD HEAD

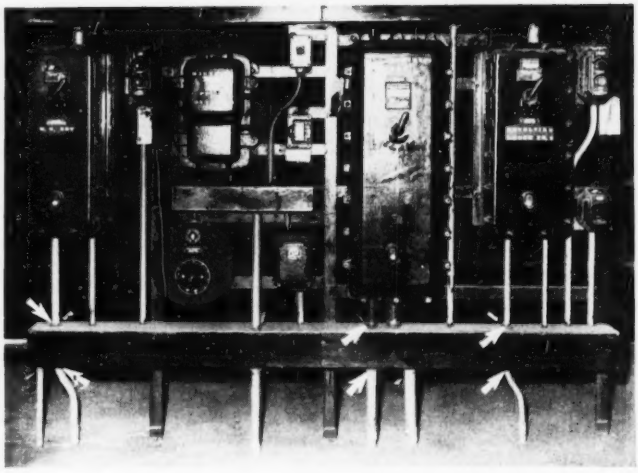
Listed by Underwriters' Laboratories, Inc., and approved by Factory Mutual Laboratories.

*ALSO— Blaw-Knox offers Standard Wet and Dry Pipe Systems, as well as Thermostatically Controlled and Supervised Deluge Systems.

FOG NOZZLE

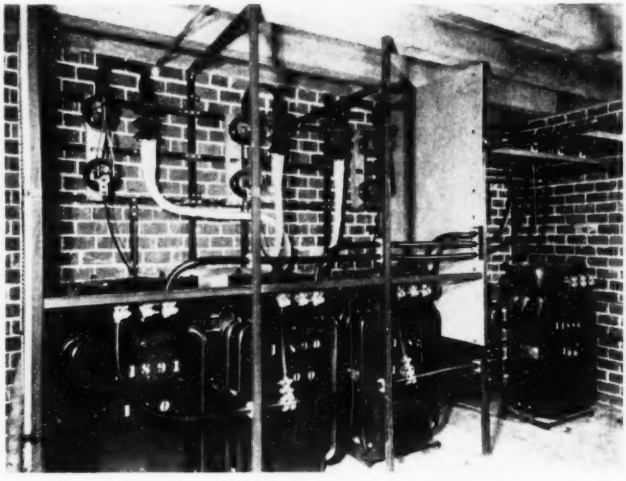
BLAW-KNOX
SPRINKLER DIVISION
829 Beaver Ave., N. S.
Pittsburgh 12, Pa.

Control-Power Circuits Isolated



In the coal handling control center at Union Electric's Ashley Street Plant, 115-v control and interlock circuits were isolated from 460-v power circuits. This was accomplished with minimum effort and expense. Conduit for interlock and control circuits was run through 460-v bus boxes by means of sleeves. Utilization of this simple technique saved bending the conduit to take in around the bus boxes.

"All-Purpose Metal Framing" Used in Vault Design



ELECTRIC SERVICE INSTALLATION at the new East Tennessee Baptist Hospital in Knoxville, Tennessee, showing Unistrut all-purpose metal framing used as the supporting structure. The versatility of this material provides convenient on-the-job erection since all adjustments could be made by the mere loosening of a nut. Supporting members could be added as work progressed. Design allows framing members to be easily added should the installation of additional transformers and cables be necessary

Only FLEUR-O-LIER gives ALL these advantages:

★ Fleur-O-Lier Index System Rating

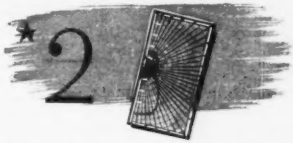
★ Photometric Data

★ Coefficients of Utilization Charts

★ Certification

MORE AND MORE architects, utility lighting men and contractors are recommending Fleur-O-Lier labeled fixtures because only with Fleur-O-Lier certified fixtures do they get *all* "the facts of light" that enable them to get the most fixtures for their money.

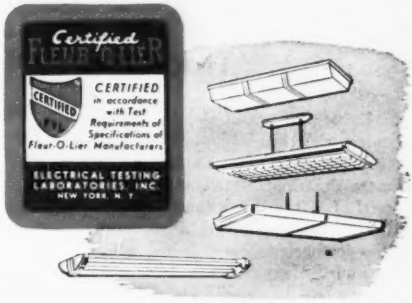
Every Fleur-O-Lier fixture is rated on the Fleur-O-Lier Index System to show its tested illuminating performance.



Complete photometric data, as found by Electrical Testing Laboratories, Inc., is provided.

Coefficients of utilization charts, compiled by Electrical Testing Laboratories, Inc., enable the buyer to select the most suitable fixture for his installation.

Certification, backed by Electrical Testing Laboratories, Inc., tests, is the buyer's assurance that the fixtures were made to rigid specifications covering electrical and mechanical features.



Specifiers and buyers are now insisting, "Be sure the fixtures bear the Fleur-O-Lier label!"

FLEUR·O·LIER

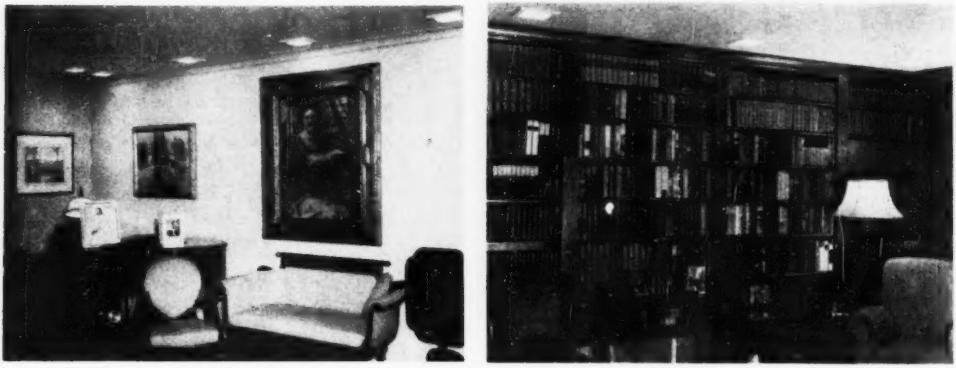
Manufacturers

2116 Keith Building • Cleveland 15, Ohio

Fleur-O-Lier is not the name of an individual manufacturer, but of a group of fixtures made by leading manufacturers. Participation in the Fleur-O-Lier program is open to any manufacturer who complies with Fleur-O-Lier requirements.

LOAD BUILDING

Commercial Units Solve Home Lighting Problem



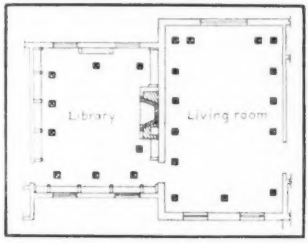
CEILING RECESSED FIXTURES with prismatic lens plates provide wall lighting in living room and library sufficient for general illumination

H. J. KREITZBERGER
Pennsylvania Power & Light Co
Hazleton, Pa.

HE DID not want the place to have an art-gallery appearance, but he did want the paintings that would grace the living room walls of his new house to be effectively illuminated. So Alvan Markle, Jr. asked the power company for some lighting advice.

At first we thought of cove lighting but discarded that since that would make the ceiling and not the oil paintings the brightest area in the room. The use of direct lighting was indicated. Suspended fixtures would certainly not be appropriate. Recessed units seemed to be the answer.

To provide the proper asymmetric distribution of illumination which would be required from a recessed unit, we considered using a prismatic lens plate in a custom built unit. But our studies indicated that if a standard classroom blackboard unit with a 100-w lamp and a standard lens plate were placed at a 15-degree offset the required results would be obtained. Calculations based on distribution curves indicated that if these units were placed 14.5 in. from the wall the illumination on the paintings would be uniform and without glare. The lateral spacing of the units was determined in relation to the ceiling height. It was necessary practically to double up on the units in the corners because both walls would have paintings hung on them.



LOCATIONS of recessed units in ceilings of living room and library

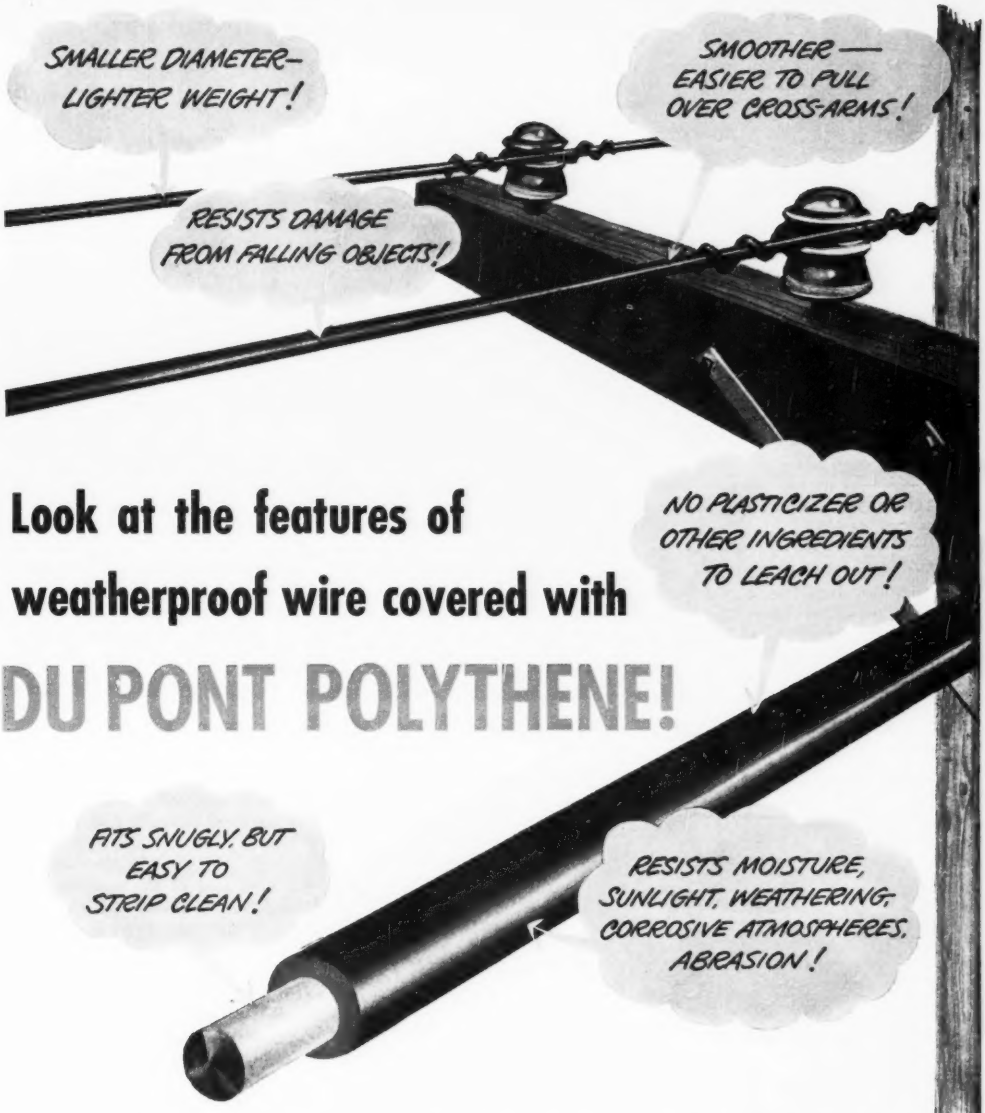
Mr. Markle liked the plan for the living room so well that he decided to use it also in the library. Some slight modification of spacing was necessary for uniform light distribution, but the picture above shows how well the scheme worked out.

Tropical Fish Culture Good Load Builder

BERT W. WHITEHURST
Professional Engineer
Boston, Mass.

EVERY FANCIER of tropical fish requires electrical equipment to heat, light, aerate and filter water in one or more aquariums. One source gives a total of 300,000 such fanciers within the United States, with about 2,000 new enthusiasts now being added monthly. Many fanciers own from two to five aquariums. On the basis of an average daily energy consumption of 1.67 kwhr, this interesting hobby consumes 1,366 million kwhr annually. Although it is a very scattered load builder, this fish breeding apparatus should be recognized as an effective 24-hr load builder.

There are many sizes of aquariums. The typical small aquarium is 12 in. wide x 12 in. high x 20 in. long. It contains about 11 gal of water. Such an installation uses a reflector having two 25-w tubular bulbs, a motor-driven air pump requiring 35-w and


SMALLER DIAMETER— LIGHTER WEIGHT!
SMOOTHER — EASIER TO PULL OVER CROSS-ARMS!
RESISTS DAMAGE FROM FALLING OBJECTS!
NO PLASTICIZER OR OTHER INGREDIENTS TO LEACH OUT!
FITS SNUGLY, BUT EASY TO STRIP CLEAN!
RESISTS MOISTURE, SUNLIGHT, WEATHERING, CORROSIVE ATMOSPHERES, ABRASION!

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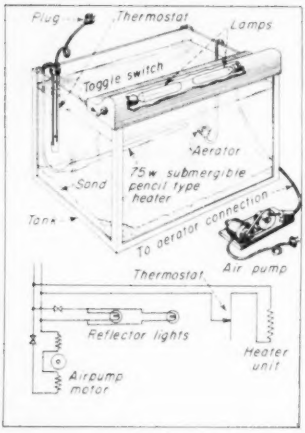
Write today for data on versatile Du Pont polythene plastic! Easy to mold, extrude and fabricate . . . offers a remarkable combination of properties to the electrical industry. E. I. du Pont de Nemours & Co. (Inc.), Plastics Dept., Main Sales Offices: Empire State Bldg., New York 1, N. Y.; 7 South Dearborn St., Chicago 3, Ill.; 845 East 60th St., Los Angeles 1, Calif.

Line wire covered with Du Pont polythene made by Anaconda Wire & Cable Co., N. Y. C.; Phelps Dodge Copper Products Corp., Yonkers, N. Y.; Rome Cable Corp., Rome, N. Y.



ARRANGEMENT of electrical equipment in typical small aquarium

a 75-w submergible type tubular water heater. The daily use of lights is about 8 hr. of the heater 12 hr, and the small air pump 24 hr. The average daily energy consumption in summer is about 1.24 kwhr, and during the winter, 2.1 kwhr.

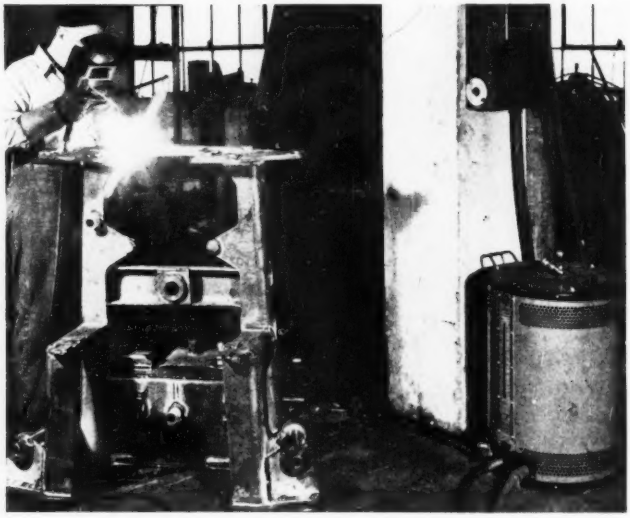
In general, two types of reflector lights are available. One calls for a single fluorescent tube (15 to 25 w). A common one is of the 2-tube filament type (15 to 80 w). Thermostatically controlled submergible and non-submergible type heaters (12.5 to 250 w) can be had. The wattage needed depends on the tank volume and the temperature difference between the water in the tank and the ambient air. Usually the thermostat is set to maintain the water at not less than 80 F. Such heaters are in service continuously during the colder months. Air pumps operating continuously are used either to aerate the water by forcing air through a porous diaphragm which produces finely divided bubbles, or by drawing the water through a filter by using an air-lift water pump.

These pumps are either of the oscillating piston or diaphragm type. The drive for the piston type is a fractional hp brush or brushless motor. For the diaphragm type either a motor or a thermal expansion unit is used. The total connected load is somewhere between 25 and 100 w according to the desired air capacity of the unit.

Cost of Equipment

Current retail prices for electrical aquarium equipment range from $2 to $6.50 for submergible heaters. Non-submergible heaters cost from $2 to $4. Thermostats sell from $3 to $6.50, lights in reflector from $6.50 to $18.25; and air pump complete with motor from $3.50 to $35. Reflector lights, thermostats, heaters, and the thermo type air pump are available for both a-c and d-c, 110-v installation. Based on a typical 12 x 20-in. aquarium the electrical equipment costs run in the vicinity of $5.50 for a 75-w submergible heater; $6.50 for the controlling thermostat; $18.50 for a 35-w motor-driven air pump and $10 for the 50-w, 2-bulb light reflector; or a total cost of $30.50 for the equipment.

Weld Machine Frame, Reduce Weight and Cost



BROOM MACHINE FRAME is fabricated by a-c welding transformer

SINCE using welding equipment in the fabrication of frames for its broom-sewing machines, the Baltimore Broom Machine Co, Baltimore, Md., has reduced both the weight and the cost of these frames, according to Charles E. McCaffrey, Engineer-Superintendent and Director of the company. The change to welded frames was brought about by the increased difficulty and delay experienced in obtaining the cast frames formerly used, and by the fact that the high cost of the castings bore heavily on the cost of the machines.

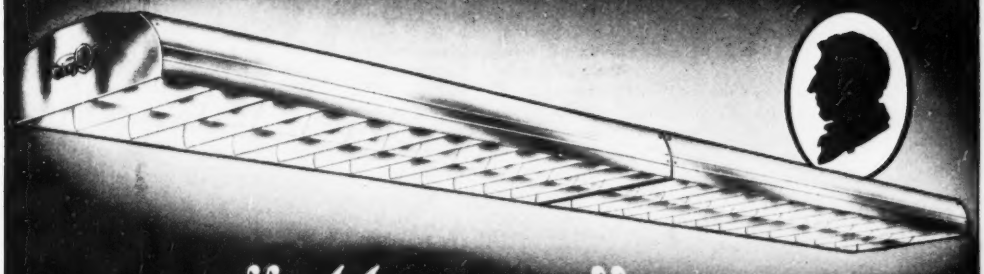
In deciding to convert to a welded frame, important consideration had to be given to the continued use of existing jigs and fixtures, as well as to the retention of the design of the numerous appending parts and the over-all practicability of a weld.

Despite these design difficulties, the engineers proceeded to fashion a workable weld. Using sheared or burned flat steel wherever possible, and a General Electric 200-amp a-c welder, they took advantage of the possibilities offered by welding to achieve lighter sections.

The resulting frame featured a marked reduction in cost, a weight decrease of 33⅓%, and a structure that is stronger than the casting.

Through the application of welding to other operations, this company expects to make possible further savings and improvement in production.

new highs in EFFICIENT & ECONOMICAL LIGHTING FOR SCHOOLS AND OFFICES



THE "Monroe" * in 4 and 8-Foot MODULES FLUORESCENT LUMINAIRES

Check these Advantages

ECONOMICAL INITIAL COST
Simplified design and construction of the basic chassis, side-panels and reflecta-louver assembly result in production economies which are passed on to the ultimate users.

LOW INSTALLATION COST
One man, working from the side and not from the bottom, hangs the bare chassis in a minimum of time. Side-panel and reflecta-louver assembly snap into position *after* the chassis is hung; no tools required. The 8-foot chassis requires less hangers and less installation time.

MAXIMUM EFFICIENCY
Permaflector Lighting Engineers have designed the Monroe to give efficiencies up to 83% with 25-35 shielding. Brightness comes well within the I.E.S. recommendations.

SIMPLIFIED MAINTENANCE
Cleaning or relamping is fast and simple. Reflecta-louver assembly hinges down from either side; full-length fibre-plate snaps out quickly for easy access to wiring channel and ballast.

FLEXIBLE APPLICATION
Plastic, aluminum or steel side-panels . . . reflector-closures that attach for totally direct lighting . . . and individual or inline installation with or without hangers—make the Monroe the "ideal" unit for many varied applications.

THESE ADVANTAGES ADD UP TO ALL AROUND LIGHTING ECONOMY!

Write today for complete details on this exceptional series of fluorescent luminaires.

Pittsburgh Permaflector

PITTSBURGH REFLECTOR COMPANY
PITTSBURGH 22, PENNSYLVANIA
Permaflector Lighting Engineers in All Principal Cities
Distributed by Better Electrical Wholesalers

PITTSBURGH REFLECTOR COMPANY
408 Oliver Bldg., Pittsburgh 22, Pa.
Please send me your bulletin which describes the Monroe Series in detail and shows specification, photometric and installation details.

Name _____
Title _____
Company _____
Street _____
City _____ Zone _____ State _____

NEW EQUIPMENT

Aerial Ladder

AN AERIAL ladder which can be fitted to any general service body with or without a high roof enclosure has been designed by J. H. Holan Corp, 4100 W. 150th St. Cleveland, Ohio. Instead of rotating, the ladder can be extended either forward or to the right side of the body where there are four locked positions. When not in use the securing-frame of the ladder can be folded against the side of the body, providing a clear working bed.

The three models available have maximum extended heights from the ground of 22, 24, and 26 ft. An adjustable platform which remains level in all ladder positions is 3 ft from ladder top.

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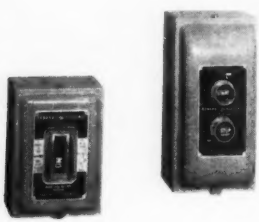

Manual A-C Starters

STARTERS for a-c motors up to 7½ hp, specially designed for use on farm machinery, textile looms, pumps, blowers, and grinders have been announced by the Control Divisions, General Electric Co, Schenectady 5, N. Y. The solder-pot relay has been replaced in these starters with bimetallic overload protection.

Available are both the toggle and pushbutton types in 2-, 3-, and 4-pole forms, sizes 0 and 1.

•

Manual Simplex Carrier

OCCASIONAL COMMUNICATION between small or unattended plants where carrier has not previously been considered economically feasible is possible with Type JY push-to-talk, manual simplex transmitter-receivers of the Westinghouse Electric Corp, 306 Fourth Ave, Pittsburgh 30, Pa.

This single-frequency, manual equipment is commonly used for routine and emergency communication between substations and main plants. It is seldom used for commercial traffic because it cannot be readily coordinated with existing telephone facilities.

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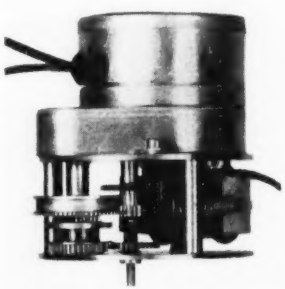
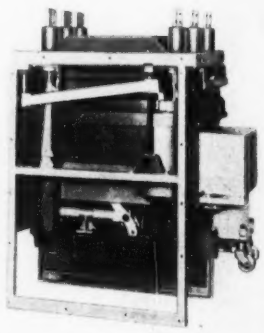


Timing Motor

TYPE SNC synchronous motor has been designed for timing, recording, indicating and switching applications requiring an accurate reset operation, by R. W. Cramer Co, Centerbrook, Conn.

The motor has a differential clutch mechanism and produces a torque of 30 in.-oz at 1 rpm. Thirty-nine output speeds from 15 rpm to $\frac{1}{4}$ rpd are available from the 2x3-in. motor, which can be furnished with a reverse clutch that engages when magnet is deenergized



OCB Replacement Unit

SPECIALLY adapted for replacing obsolete oil circuit breakers of insufficient interrupting capacity in older distribution substations without discarding existing equipment is the Ruptair unit made by Allis-Chalmers Mfg Co, 932 S. 70th St. Milwaukee, Wis. The removable magnetic air circuit breaker is equipped with wheels so that it can be withdrawn for replacement or maintenance.

Unit is offered with interrupting capacities of 100, 150, and 250 mva at 4,160 v and 100 and 150 mva at 2,300 v; current capacities are 600, 1,200, and 2,000 amps. Complete description is contained in bulletin 18B7094.

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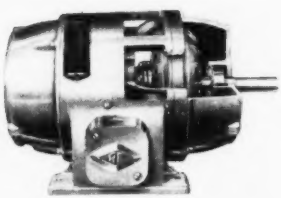

Fluid-Drive Motor

STARTING and operating shocks are absorbed in a cushion of oil in the single-frame, integrally designed fluid drive motor developed by Reuland Electric Co, Alhambra, Calif. Loads that are difficult to start, or require smooth

DRIVEPOINT!

look for it on all **HUBBARD BOLTS**

How it helps YOU!

Easier, faster starting of nuts.
Acts as a Drift Pin.
Protects thread when bolt is driven out or when stud bolts are driven in.
Drivepoint finds the hole—easier, quicker installation.
Costs no more than ordinary machine or cross-arm bolts.

HUBBARD AND COMPANY
PITTSBURGH CHICAGO OAKLAND CALIFORNIA

LET OUR CUSTOMERS* TELL YOU WHY THEY USE the CHANCE 8-way Anchor

"easier to expand"
"easier to spread in hard earth"
"LESS LOSS FROM DAMAGE"
"... they withstand additional strain ..."
"WE LIKE THE 8-WAY"
"less effort spent in spreading"
"our men like to use the 8-way better than any other"

*Names on request.

Yes... the Chance 8-way Anchor gives you better anchoring for less money. Greater load distribution, due to the cone shape and the close proximity of the blades, makes this new anchor more powerful than other types of expanding anchors. Simplified construction makes the 8-way easier to expand and more applicable to varied soil conditions. This simplicity also saves on manufacturing costs—and this saving is passed on to *you!*

Investigate the Chance 8-way Anchor—you'll agree with others—"It's the best buy on the market."

You know it's RIGHT when you specify CHANCE

A·B·CHANCE CO·

CENTRALIA, MISSOURI • SAN FRANCISCO, CALIFORNIA

ABC INDUSTRIES

acceleration and protection from "jamming" and shocks are said to be especially suitable for this motor. Acceleration is said to be handled smoothly because the motor is practically up to speed before any load is applied.

No special engineering is required to install these units which can be had in nine sizes ranging from ½ to 10 hp. Single or double reduction types providing slow output speeds are also available.

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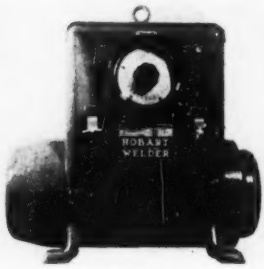

D-C Welder

FIVE RANGES of welding current and 100 steps of v-a adjustment in each range for selecting any desired arc characteristics can be obtained with the "Bantam Champ" d-c arc welders produced by Hobart Brothers Co, Box 189, Troy, Ohio, to fill a demand for low cost equipment.

Illustrated is model MZ-200-S, rated at 200 amps, 30 v, 50% duty cycle. Current range is 40 to 250 amps at an operating speed of 3,450 rpm; weight is about 340 lb. The squirrel cage induction motor can be connected at the starting switch for either 220 or 440 v power supply.

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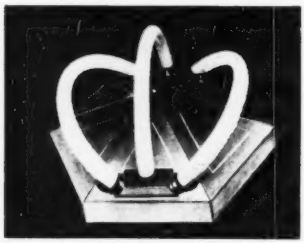


Ceiling Fixture

PLACEMENT of the lamps on their ceiling fixtures assures maximum light output according to the Homecraft Electronic Products, 1208 S. Kedzie Ave, Chicago 23, Ill. Three Circlare 18 w lamps are held in place by non-

NOW READY FOR YOU....

THE NEW

"Job Size Roll"

REG. U.S. PAT. OFF.

SCOTCH BRAND No. 33 Electrical Tape

Twelve "Job Size" twenty-foot rolls of "SCOTCH" No. 33 Electrical Tape in a strong neat tube — each roll a convenient one day supply. Your electricians will like it because the new twenty-foot roll is easy to use and easy to carry; YOU will like it because its neat compact tubes take up little storage room and give the tape perfect protection while in stock. The twenty-foot roll is an average day's supply for an electrician with a steady schedule of wiring assignments.

Order from your jobber today and enjoy the convenience and economy of "SCOTCH" No. 33 Electrical Tape in the "Job Size" Roll.

Made in U. S. A. by
MINNESOTA MINING & MFG. CO.
St. Paul 6, Minnesota
also makers of other
"SCOTCH" Brand Pressure-Sensitive Tapes, "UNDERSEAL" Rubberized Coating, "SCOTCHLITE" Reflective Sheeting, "SAFETY-WALK" Non-Slip Surfacing, "3M" Abrasives, "3M" Adhesives.

ANOTHER 3M PRODUCT

REG. U.S. PAT. OFF.
SCOTCH BRAND No. 33 Electrical Tape

General Export: DUREX ABRASIVES CORP., *New Rochelle, N. Y.*
In Canada: CANADIAN DUREX ABRASIVES LTD., *Brantford, Ontario*

CRESCENT
IMPERVEX TRENCHCABLE

TYPE RR

Your best answer for dependable underground cable at low cost

CRESCENT IMPERVEX TRENCHCABLE is a versatile low-cost, non-metallic armored cable for aerial and direct earth burial installations as well as for use in conduit and ducts, indoors and outdoors. The use of multi-conductor IMPERVEX TRENCHCABLE in place of multi-conductor lead-covered cable not only will show substantial savings in the initial cost of the cable but because of its light weight and ease of installation, splicing and terminating will result in installation economies also. Even greater savings can be obtained when IMPERVEX TRENCHCABLE is used for direct earth burial as it does not require conduit or duct for such installations.

CONSTRUCTION

Insulation on each conductor is CRESCENT IMPERVEX, a special moisture-resisting, heat-resisting, long-life compound possessing excellent dielectric stability in the presence of water. Over the insulation on each conductor is applied a color-coded, moisture-resisting covering. The overall armor is a tough, vulcanized NEOPRENE sheath which completely fills the interstices between the cabled conductors as well as providing a protective sheath over the insulated conductors.

FEATURES

Lighter in weight, more flexible, easier to handle and install than metallic covered cables. No fibrous coverings to rot or deteriorate. The NEOPRENE armor is flame-retarding, resistant to impact, abrasion, grease, oils, ground water, soil acids and alkalies and practically unaffected by exposure to sunlight, air and weather

USES

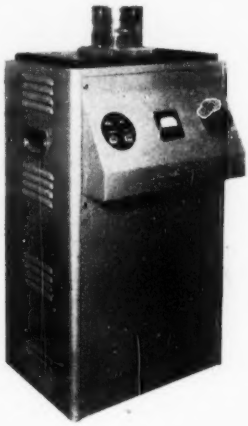
For light and power circuits for industry, utilities, mines, railroads, airports, ball parks, etc.

CRESCENT INSULATED WIRE & CABLE CO.

TRENTON, N. J.

OVER 60 YEARS EXPERIENCE

slip holders which tighten on the plastic base of the lamps. Underwriters' approved, fixture weighs a little over 6 lb with a steel back plate.



Ultrasonic Generator

INTENDED for ultrasonic research in physics, chemistry, and biology is an ultrasonic generator developed by the Special Products Div, General Electric Co, Schenectady 5, N. Y. High frequency electrical power is converted into mechanical vibrations at 300, 500, 750, or 1,000 kc.

Entirely self-contained in a steel console, the equipment consists of a power unit and a transducer assembly. Material to be tested is placed in a test well and directly exposed to vibrations from the crystal. Console size is 45x21x19 in. Power input is 500 w, 115 v, 50 cycles, while power output is 200-250 acoustical watts. More information is found in bulletin GEC-544.

Thermal Conductivity Units

IMPROVED THERMAL conductivity units for gas analysis have been marketed by Gow-Mac Instrument Co, 22 Lawrence St, Newark 5, N. J. Designated Type "M", manufacturer states that they can be readily incorporated into existing pyrometer circuits.

Model M/K-8 is an eight filament bridge with doubled output, mounted in a 6x6x6 in. steel cabinet with gas-flow fittings and electrical terminal strips. Output is 1.7 mv for 1% CO and 11.8 mv for 1% H_2 in air. Other models are the M/K-SS made of stainless steel for containing corrosive gases, and the more sensitive four-spiral filament M/T type.

You can depend on penta-chlorophenol-treated poles!

Reliability is an outstanding reason for the popularity of PENTAchlorophenol-treated poles. PENTAchlorophenol gives *positive*, thorough protection against termites and decay.

This scientific preservative not only lasts through the years but remains effective *all that time*. In addition, the linemen like it—*it leaves the poles clean!*

PENTAchlorophenol is available now. For tested, lasting preservation, treat poles, cross-arms, timber and ties with PENTAchlorophenol—the *modern* wood preservative.

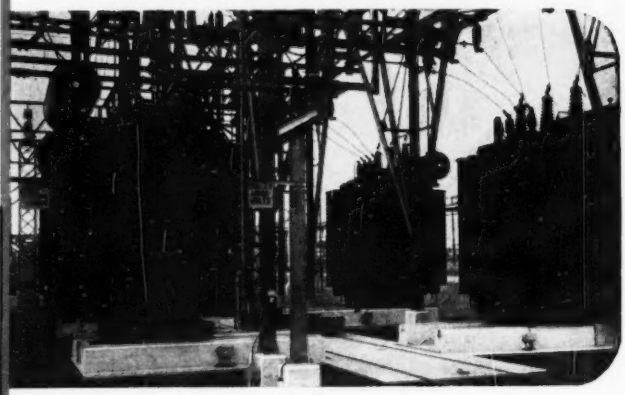
THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

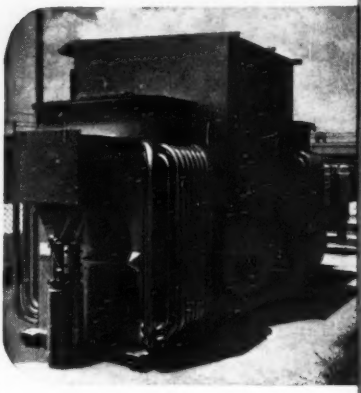
DOW

penta-chlorophenol

power
FOR PRODUCTION

This bank of Wagner Power Transformers is part of the main substation at the Houston, Texas Refinery of Shell Oil Company, Inc.





A Wagner Unit Substation, one of several small substations serving in the same plant.

In addition to power transformers, Wagner manufactures Rural Line, Distribution and Substation Transformers. Whatever your transformer requirements may be Wagner can furnish the exact type of transformer to fit your need.

Wagner
TRANSFORMERS
can solve your power planning problems

These power transformer installations, part of the recent catalytic cracking and lubricating oil plant extension at the Houston, Texas Refinery of the Shell Oil Company, are typical of Wagner Transformer installations for industrial power systems.

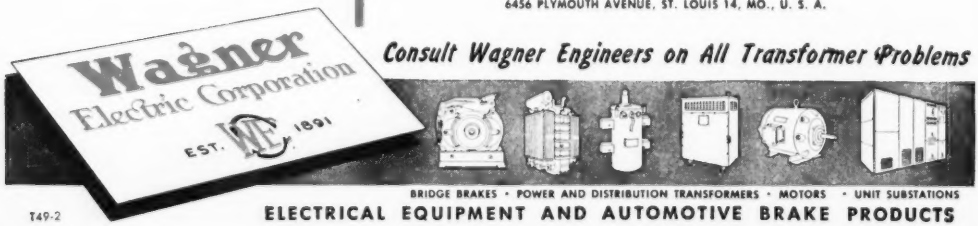
Wagner Power Transformers have established enviable records for continuous service in thousands of industrial plants and on transmission lines from coast to coast. Carefully controlled production methods, highest quality materials, rigid inspection and tests, and more than fifty-five years of transformer engineering experience mean that you can count on Wagner Transformers for dependable performance, plus added safety . . . added economy . . . and added service.

Users of power transformers will find it to their advantage to consult Wagner engineers on all of their transformer requirements. Wagner transformer users also profit by speedy, nationwide service facilities. Twenty-nine branch offices, manned by trained field engineers, are ready to serve you. Write for Bulletins TU-180 and TU-181 for information on the complete line of Wagner Transformers.

Wagner Electric Corporation

6456 PLYMOUTH AVENUE, ST. LOUIS 14, MO., U. S. A.

Consult Wagner Engineers on All Transformer Problems



BRIDGE BRAKES • POWER AND DISTRIBUTION TRANSFORMERS • MOTORS • UNIT SUBSTATIONS

T49-2

ELECTRICAL EQUIPMENT AND AUTOMOTIVE BRAKE PRODUCTS

Outdoor Luminaires

A COMPLETE line of fluorescent luminaires encompassing standard street lighting, low-level mounting applications, as for bridges or airport approaches, and underpass illumination has been announced by General Electric's Lighting and Rectifier Divisions, Schenectady 5, N. Y.

Wide areas of pavement brightness are provided by the two or four 8-ft Slimline lamps mounted in tubular aluminum housing of Form 200 street lighting luminaire. Form 201 is equipped with an 8-ft lamp, and is intended for low level mounting. Mounted end-to-end in a tunnel or underpass, the single 6-ft Slimline lamp of Form 202 luminaire is designed to throw an almost continuous path of light on the tunnel walls as well as on the roadway.

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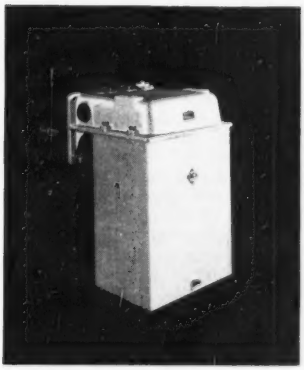

Full-Voltage Starter

ESPECIALLY ADAPTABLE for use in industries in which corrosive vapors or combustible dust laden atmospheres are present is a wall-mounted, full-voltage starter made by Allis Chalmers Mfg Co, Milwaukee, Wis.

Type 371 starter controls squirrel cage motors and the primary of wound rotor motors of 350 hp or less at 2,300 v. It is actuated by a pilot device such as push buttons, float, or pressure switches. Entire mechanism is immersed in oil and sealed from the atmosphere in event of outdoor installation. An auxiliary switch provides for extra control-system circuits.

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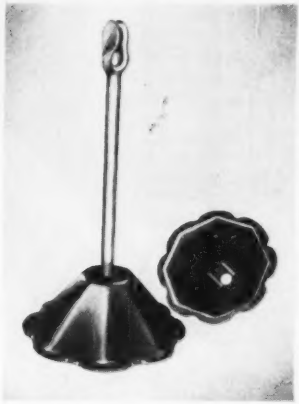

Cone Guying Anchor

INTENDED for use when guying in hardpan, adobe clay, or rocky soil is a drop forged steel cone anchor manufactured by A. B. Chance Co, Centralia, Mo. Anchor has eight flat faces and a flaring base which wedge against the fill. Made 8, 10, 12, and 16 in. in diameter, the anchor is locked securely to the rod by a nut retainer for ease in installation.

•

Mobile Communication

DESIGNED for such services as public utilities, police and fire protection, forestry and transportation is the "Fleetfone" of the Engineering Products Dept, Radio Corp of America, Camden, N. J. This two-way mobile communication system is operated in the 30-50 mc band.

An automatic modulation control locks the voice input level at a constant amplitude. Equipment also has provision for either single-frequency or two-frequency operation, and the system is equipped with a dynamotor power supply.

In addition to a 30-w model which operates from a 12-v battery, there are units of 30 or 60 w output used with a 6-v battery. Transmitter-receiver unit weighs 45 lb; control unit, 1¾ lb.

how to plan
rate
structures
that attract
new capital

THE PROBLEM:

To provide adequate earnings in the face of

- increased operating expenses
- growing plant investments with higher new money costs
- expanding and changing loads

THE SOLUTION:

LET EBASCO HELP YOU MAKE SOUND PLANS—

1. Its recommendations are backed by 40 years of operating and consulting experience.
2. Its solutions are practicable and workable.

EBASCO
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ENGINEERS · CONSTRUCTORS
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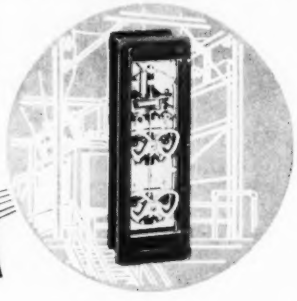
ENGINEERS · CONSULTANTS

Appraisal · Budget · Business Studies · Consulting Engineering
Design & Construction · Financial · Industrial Relations
Inspection & Expediting · Insurance & Pensions
Purchasing · Rates & Pricing · Research · Sales & Marketing
Systems & Methods · Taxes · Traffic

Telemetering Systems

For Speedy, Accurate, Remote Measurement



Measure Current, Voltage, Power, Pressure, Position, Flow, and other quantities

Use Any Indicating Or Recording End Device

General Electric telemetering systems can help increase the speed and accuracy of many of your control functions. They are an economical means of providing needed information from one or many sources at a central control point.

SPECIAL ADVANTAGES are offered with the G-E frequency-type system. It has rapid response, continuous output, and maximum channel utilization, and is usable over long distances. It requires virtually no maintenance because it has neither contacts nor electrochemical relays. In addition, it's accurate and stable despite fluctuations in supply voltage.

FULL DETAILS on the three G-E systems (frequency-type, torque balance, and photoelectric) plus various combinations of them, are available in a new bulletin, GEA-5233. It has diagrams and pictures of many different telemetering arrangements. Get a copy from your nearest G-E office. Or write today to *Apparatus Department, General Electric Company, Schenectady 5, New York.*

GENERAL ELECTRIC

602-164

MORE NEW PRODUCTS
about which you should know

Preformed Line Products Co, 1051 Power Ave, Cleveland 14, Ohio, now has available preformed **armor rods** and **tap armor rods** for use on copper and copperweld conductors to prevent arcing and burning caused by loosened clamps; also protects conductor from nicks, scars, or pitting due to hot-tap clamps. . . . Beverly Shear Mfg Co, 3001 W. 111th St, Chicago, Ill., has introduced a hand operated **cable cutter** employing a slicing, rather than a pinching action to assure clean cutting at one stroke; said to be particularly adapted to cutting hollow core material, heavy cable, and conduit.

Westinghouse Electric Corp, Box 868, Pittsburgh 30, Pa., has an improved **handle mechanism** for circuit breaker and control cabinets with facilities for three locks; indication is provided for "tripped", "reset", and "open cover" positions, as well as "off" and "on". . . . Brown Instruments Div, Minneapolis-Honeywell Regulator Co, has developed a non-ink-throwing, solenoid-actuated **pen** for speedy recording on circular chart electronic potentiometers.

Midwest Automatic Control Co, 510 Third St, Des Moines, Ia., is producing a **wire** for electric controls using numbers instead of color-coding to increase ease of installation and maintenance; "Magic Wire" has its code number imprinted permanently in red on every inch of the yellow insulation. . . . Electronic Rectifier Co, Rochester 2, N. Y. has Model N3OVP **rectifier** for small plating shops and experimenters; it utilizes selenium stacks to provide full-wave rectification variable continuously from 0 to 8 v.

Apparatus Dept, General Electric Co, Schenectady 5, N. Y., has available totally enclosed flywheel **loom motors**, $\frac{3}{4}$ to 2 hp, 1800 to 1200 rpm; further information in bulletin GEA-5011B. . . . Reeves Pulley Co, Columbus, Ind., has redesigned its Vari-Speed Jr. (six sizes up to $1\frac{1}{2}$ hp) which provides variable **speed control** for small machinery, such as grinders, saws, and blowers, without stopping the machine.

Johns-Manville, 22 E. 40th St, New York 16, N. Y., has a plastic **spacer** weighing only a few ounces for use with their asbestos-cement conduit which is used for masonry-enclosed electrical systems. . . . Stern Corp, 436-A Fourth Ave, Pittsburgh, Pa., has an attachment to standard electric **soldering irons** of from 75 to 250 w which holds more than 6 ft of solder; slight pressure on trigger brings solder to tip of the iron in exact quantity needed.

BECAUSE of the combination of URC saturants and finishers with an interlocked, fibrous construction, Duraline effectively resists moisture penetration during long periods of wet weather.

Duraline covering doesn't come apart or festoon; gives valuable protection against outages caused by foreign objects contacting lines.

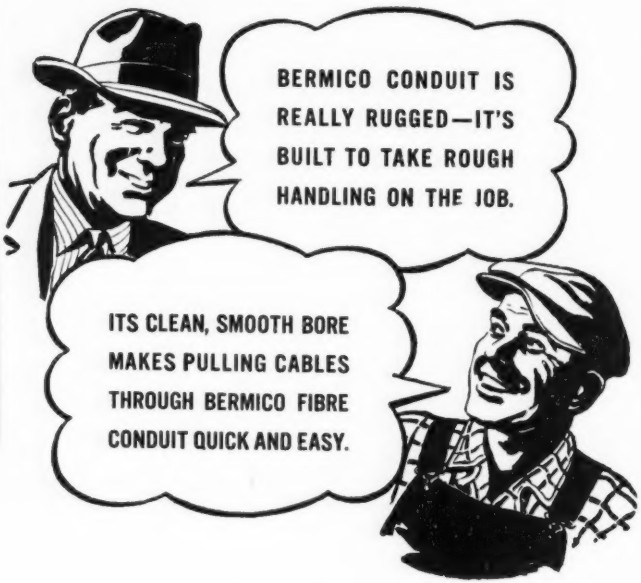
For vastly improved performance during emergency periods and long, dependable service in all seasons and climates at no extra cost, specify Anaconda *Duraline* URC Weatherproof. Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

ANACONDA

Duraline* URC WEATHERPROOF

STAYS PUT!

BERMICO* FIBRE CONDUIT


BERMICO CONDUIT IS REALLY RUGGED—IT'S BUILT TO TAKE ROUGH HANDLING ON THE JOB.
ITS CLEAN, SMOOTH BORE MAKES PULLING CABLES THROUGH BERMICO FIBRE CONDUIT QUICK AND EASY.

distributed by
WESTINGHOUSE ELECTRIC SUPPLY COMPANY
Offices in all leading cities

BERMICO FIBRE CONDUIT—A PRODUCT OF BROWN COMPANY

Automotive Rubber Co, 8601 Epworth Blvd, Detroit 4, Mich., has standardized its rubber **insulated clips**, clamps and fasteners; catalog sheets furnished on request. . . . General Electric Co, Schenectady 5, N. Y., has developed **Alnico 7** as a permanent magnet material of high coercive force for use where a high demagnetizing force is present, as in motors and generators.

Edwin F. Guth Co, 2615 Washington Ave, St. Louis 3, Mo., is marketing recessed **reflectors** called "Top Hats" for use with R-40 lamps and architectural treatments of incandescent lighting. . . . Pierce Governor Co, Anderson, Ind., has a centrifugal-type engine **speed governor** featuring a flexible drive shaft permitting installation at the carburetor of any standard automotive-type engine.

The Bristol Co, Waterbury, Conn., has developed the **"electronic pyrotrol"** to safeguard gas-fired furnaces, boilers and similar industrial heating equipment from danger of gas explosions during ignition, operation, and shut-off. . . . Romec Div, Lear Inc, Elyria, Ohio, is producing a **filter-dehydrator** capable of taking and holding 6 to 8 oz of water vapor from transient air or gas in processes requiring dry air.

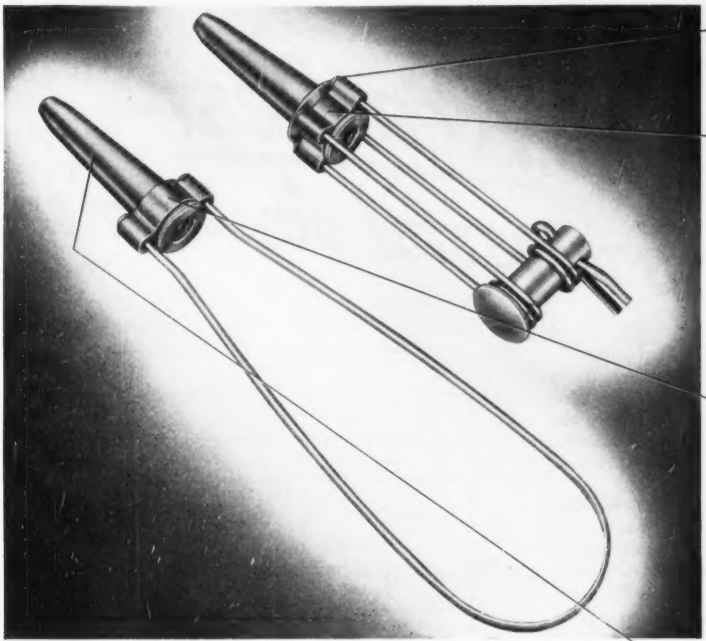
Westinghouse Electric Corp, Box 868, Pittsburgh 30, Pa., has available single-circuit sectional **terminal blocks** which can be assembled into strips of up to 75 pairs of terminals; available in 25 and 50 amp sizes suitable for up to 600 v. . . . Stone Mfg Co, Elizabeth, N. J., has introduced a multiple wiring **trough** which mounts up to 8 lamp holders.

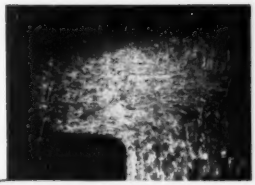
General Control Co, 1200 Soldiers Field Rd, Boston, Mass., has a protected foot-treadle actuated **switch** to prevent unintentional or false operation by falling objects; footswitch comes in many styles with ratings of 10 amp at 125 v, and 20 amp at 125/250/460 v a-c. Also available are a light-weight, high speed foot switch and a single push-button switch affording alternate-contact operation.

Westinghouse Electric Corp, Box 868, Pittsburgh 30, Pa., has introduced a **welding control** designed to operate a welding transformer so as to convert power drawn from a 3-phase line to a lower frequency single-phase supply for the electrodes of a resistance welder; 60-cycle power source of 220, 440, or 550 v is satisfactory. Westinghouse also has a NEMA 3B sequence time-welder for non-synchronous resistance welders operating at up to 450 spots per minute on 20 gauge steel.

Jefferson Electric Co, Bellwood, Ill., has developed a line of narrow 30 ma **transformers** with secondary voltages of 7,500, 9,000, 12,000 and 15,000 for use with neon signs.

Accents on Accuracy

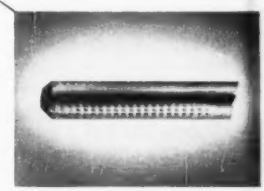




1. Full strength of bail is realized by tool design that flows steel smoothly into head, strengthening the grain structure.

2. Close control of bronze yoke insures sufficient bearing area against headed bail.

3. Tubing is not only held closely to size, but also to smooth inside finish, because folds or occlusions might hamper perfect performance.



4. Tapers of jaw and tube are accurately limited so wire is not pinched sharply where it enters jaws. This prevents fatigue breakage of wire.

in the manufacture of

STRAIGHTLINE DEADENDS

Here is a line of truly corrosion resisting deadends—products that will really last in any climate—at prices no higher than ordinary galvanized fittings. It takes accuracy of manufacture plus ingenuity and economy of design to use the best materials available regardless of cost and make a superior product at a competitive price.

The new type LDS, Long Deadends with the true Stainless bails for disc insulators, and FDS, Flexible Deadends with the true Stainless bails for spool and strain insulators are very light in weight. This reduces vibration fatigue tendencies. They are designed for easy installation and built with ample safety factor, which permits them to do the job both quickly and perfectly.

Reliable ELECTRIC COMPANY

3145 CARROLL AVENUE, CHICAGO 12, ILLINOIS

OVER 40 YEARS OF SERVICE TO THE UTILITIES

POWER-LINE CONNECTORS
AND
CONSTRUCTION SPECIALTIES

Acceptance the Real Test of a successful development

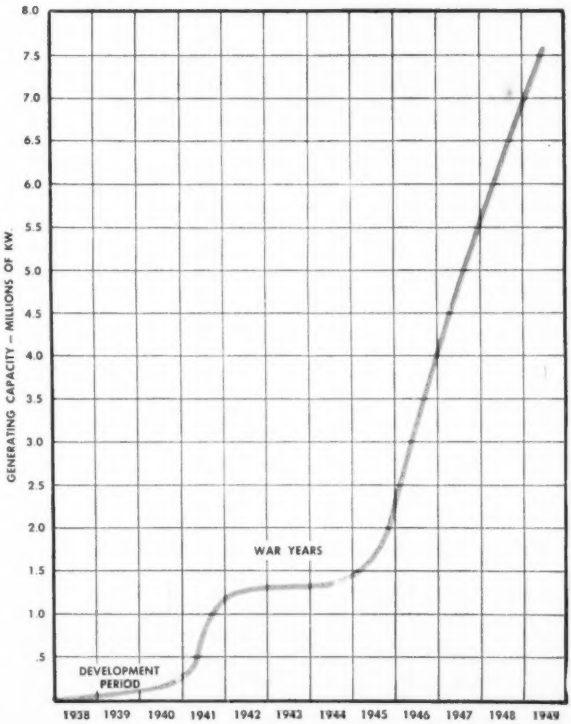
The enthusiastic acceptance by the electric utility companies of the Vertically-adjustable Burner—major adjunct to Combustion's long established tangential method of firing—is graphically expressed on the accompanying chart. It tells the story more clearly perhaps than mere words can.

Introduced initially in 1938, this burner—it's more than a burner, it's a method of firing—went through a brief development period, was successfully applied in several plants, and then ran into war restrictions which precluded utility station expansion. Nevertheless, the die was cast, and when a tremendous postwar utility expansion program got under way in 1945, the Vertically-adjustable, Tangential Burner—the Tilting Burner, if you will—zoomed to immediate success.

Since the war's end electric utilities have installed or ordered C-E pulverized coal fired units with an aggregate capacity in excess of **64,000,000 lb** of steam per hr, **88%** of which is equipped with Vertically-adjustable, Tangential Burners . . . well over **1,000,000 KW** a year is the postwar average capacity of the units equipped with "Tilting Burners."

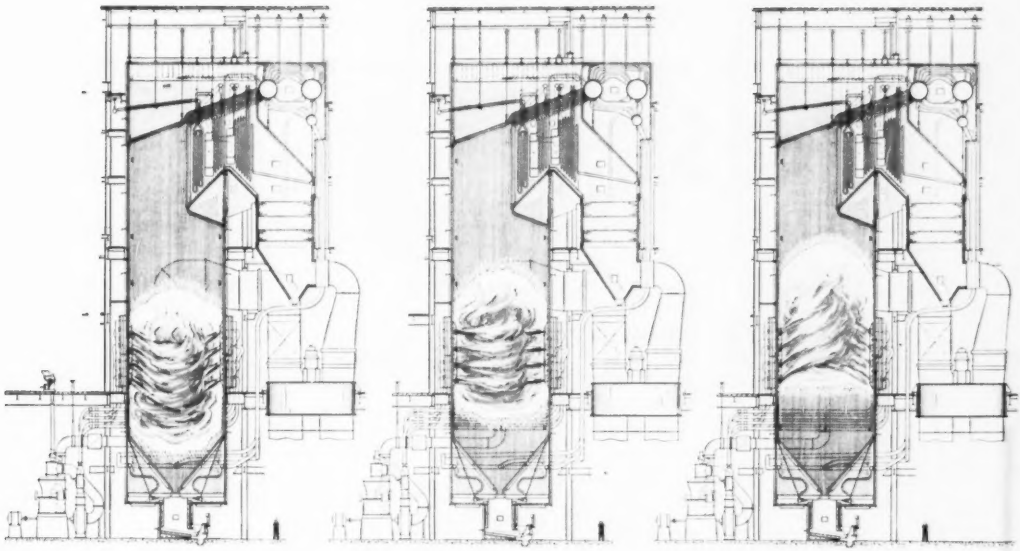
No other burner—no modern method of firing pulverized coal—can point to any such record of buyer acceptance.

The diagrammatic representation of the "Tilting Burner" and resumé of its principal advantages, given on the opposite page, will assist in understanding the reasons for its success. B-345



COMBUSTION ENGINEERING

A MERGER OF COMBUSTION ENGINEERING COMPANY, INC. AND THE SUPERHEATER COMPANY



Advantages of the Tilting Burner

The combination of tangential firing and the Vertically-adjustable Burner accomplishes certain highly important results beyond the reach of any other burner or firing method presently available. These are:

1. Control of the temperature of furnace gases at the furnace exit which permits:

(a) Control of superheat temperatures over a wide range.

(b) Minimum use of desuperheating spray.

(c) Use of wide variety of coals.

(d) Accurate proportioning of superheater and reheater surfaces.

(e) Lower air heater maintenance.

2. Substantial control over slagging conditions which results in:

(a) More uniform furnace conditions.

(b) Better heat absorption.

(c) Minimum use of soot blowers.

—SUPERHEATER, INC.

200 MADISON AVENUE NEW YORK 16, N. Y.

C-E

For STEEL in a hurry

Call RYERSON

Wherever you are in America, there's a well stocked Ryerson steel plant within quick shipping distance. From thirteen strategically located points, Ryerson carbon, stainless and alloy steels in thousands of kinds, shapes and sizes are ready for immediate delivery.

By carefully specifying and checking, we are able to certify to the consistently uniform high quality of our steels. And to help you select the type best suited to the job at hand, the services of experienced Ryerson specialists are always yours for the asking.

Widely diversified Ryerson stocks enable you to procure many steel requirements at the same time from the same source. One order—one invoice does the job. So save time, save paperwork and be sure of uniform quality. Call Ryerson when you need steel.

PRINCIPAL PRODUCTS

BARS—Carbon & alloy, hot rolled & cold finished
SHAFTING—Cold finished, ground and polished, etc.
STRUCTURALS—Channels, angles, beams, etc.
TUBING—Seamless & welded mechanical & boiler tubes
STAINLESS—Allegheny plates, sheets, bars, tubing, etc.
PLATES—Sheared & U. M., Inland 4-Way Floor Plate
SHEETS—Hot & cold rolled, many types & coatings
MACHINERY & TOOLS—For metal working

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON
PHILADELPHIA • DETROIT • CINCINNATI • CLEVELAND • PITTSBURGH • BUFFALO
CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO

RYERSON CERTIFIED STEELS

RYERSON STEEL

NEWS ABOUT PEOPLE

PP&L Elects F. C. Mueller V-P, Luzerne Division

In a consolidation of two anthracite area divisions, Pennsylvania Power & Light Co's Wilkes-Barre division manager, Frank C. Mueller, has been made vice-president of the new Luzerne division.

FRANK C. MUELLER

J. S. Davidson, now division manager at Hazleton, moves to Harrisburg in the same capacity. D. A. Elias, present head of the Harrisburg division, will continue as vice-president until his retirement at the end of the year.

Mr Mueller resided in Allentown from 1924 to 1926 at which time he was assigned to the office of President Oakes, then special assistant to the operating manager of the utility. He will continue his office at Wilkes-Barre, which will become the commercial administration headquarters of the newly-formed Luzerne division.

Mr Davidson joined PP&L as an assistant to the vice-president in 1937, after an association with the Nebraska Power Co. He served as district manager of the Allentown district from 1938 to 1940 when he was made manager of the Hazleton division.

•

W. W. Viebahn, Litchfield, is the new president of the Minnesota Municipal Utilities Association.

W. E. Montgomery, formerly assistant operating engineer, Southern California Edison Co, Los Angeles, has been appointed operating engineer to succeed the late P. H. Gilbert. **A. G. Denyer** has been appointed to succeed Mr Montgomery. Mr Montgomery has a long company service record to his credit, having started as an apprentice substation operator in 1926. Mr Denyer joined the company in 1914.

•

K. R. Way Joins Staff of Jasper Blackburn

Kenneth R. Way has been appointed assistant sales manager of the Jasper Blackburn Products Corp, St. Louis, Mo.

KENNETH R. WAY

Mr Way has had a wide experience in the electrical field, having spent several years as sales manager of the A. B. Chance Co and was previously associated with the Line Material Co.

•

James M. Seay, vice-president and treasurer of the New York Power & Light Corp, Albany, has retired.

Harold G. Morse, superintendent of power plants, Narragansett Electric Co, Providence, R. I., has been appointed assistant superintendent of production. He entered the company in 1919 as a master mechanic, and has since served as assistant chief operating engineer, chief operating engineer, and superintendent. **Albert J. Wells** has been promoted from plant betterment engineer to assistant to the superintendent of power plants. He joined the Narragansett company in 1943.

Dr McEachron Assigned Managerial Duties by GE

Dr Karl B. McEachron, well known lightning pioneer, has been named manager of engineering for the General Electric Co's transformer and allied product divisions at Pittsfield, Mass. Formerly assistant manager of engineering for the divisions, Dr McEachron succeeds Frederick F. Brand, who has retired after 47 years of service.

He first became identified with GE in 1913 as a student engineer, but the following year returned to his Alma Mater, Ohio Northern University, to join the teaching staff, subsequently engaging in research work at the engineering experiment station of Purdue University. He returned to GE in 1922 to take charge of research in the lightning arrester engineering department at Pittsfield, the position he held until his appointment as engineer in charge of the high voltage engineering laboratory. For the development of "Thyrite," Dr McEachron received the Charles A. Coffin Award and the Longstreth Medal of the Franklin Institute.

DR K. B. McEACHRON

Other recent appointments in the transformer and allied products divisions include Harry F. McRell, formerly manager of sales for the divisions, as assistant to the manager of the divisions; F. E. Fairman, Jr, named to succeed Mr McRell; Williams S. Ginn, made assistant manager of sales, and Clement E. Sutton, Jr, manager of the power transformer sales diisions.

Long active in the transformer sales

KOPPERS

Long-Life Poles and Crossarms

UNINTERRUPTED SERVICE! . . . that's what you are constantly striving to give your customers. And you are off to a good start when you specify Koppers—the poles that are pressure-creosoted against decay . . . that *retain* their strength, and last, on the average, *more than thirty years.*

For maximum utility, combine Koppers Pressure-Treated Crossarms with Koppers Long-Life Poles. Together, they give you the lowest annual costs, and give you best assurance of uninterrupted service.

KOPPERS COMPANY, INC.
Pittsburgh 19, Pa.

Deliveries of Koppers Pressure-Creosoted Poles are made promptly from many conveniently located treating plants.

KOPPERS **PRESSURE-CREOSOTED WOOD**

divisions, Mr McRell has been senior transformer specialist in the company's New York, St. Louis and Chicago offices. In 1942 he became assistant manager of sales, transformer sales division, four years later manager of sales for that division, and in 1947 manager of sales for the transformer and allied products divisions.

Mr Fairman first joined GE in 1923, but two years later left to become identified with the Pennsylvania Water & Power Co. He returned to GE the same year. In 1933 he joined the sales section of the switchgear divisions in Philadelphia and later became assistant manager of sales.

•

Owen Made Sales Director, Western Insulated Wire

Murray Owen has been appointed general sales manager of the Western Insulated Wire Co, Los Angeles. Mr

MURRAY OWEN

Owen becomes identified with Western after 28 years with the General Electric Co.

Mr Owen joined GE in 1920, and in 1922, at the time of the organization of the York wire division, he was transferred to that plant. Several years later he was appointed manager of the entire York division of GE in charge of engineering, manufacturing, and sales. During his last three years there, prior to his retirement, he was in charge of the entire electrical cord and cable division, construction material department.

•

W. E. Mahin, chairman of metals research at Armour Research Foundation of Illinois Institute of Technology, has been named director of research. Mr Mahin will head a group of 411 scientists, engineers, and technicians who are at present working on 125 active research projects for industrial and government sponsors. For 10 years previous to his joining the Research

Foundation in 1947, Mr Mahin was in charge of metallurgical engineering at Westinghouse Electric Corp, Pittsburgh, Pa. He succeeds Dr Martin H. Heeren, who is now identified with the Elgin National Watch Co, Aurora, Ill.

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Westinghouse Makes New Engineering Appointments

Two executive appointments in the engineering department of the Westinghouse Electric Corp's atomic power division have been announced. **Bernard F. Langer** becomes manager of structural and heat engineering and **Erling Frisch** manager of control engineering.

Mr Langer began his career with Westinghouse in 1926. As a research engineer in the mechanics department of the research laboratories, he specialized in railway mechanics and instrument development. Formerly manager of the compressed air circuit breaker section at the East Pittsburgh Works, Mr Frisch joined Westinghouse in 1923.

W. C. Rowland has been made manager of the company's manufacturing and repair division. His appointment was made in view of the illness and approaching retirement of Vice-President H. F. Boe, who has headed manufacturing and repair activities since 1938.

R. P. Wagner has been appointed manager of the industrial products advertising and sales promotion department with headquarters in Pittsburgh. He succeeds **J. H. Thomson,** who has become a vice-president with Electrical Publications, Inc. Mr. Thomson will be located in Cleveland.

E. C. Whitney has been appointed manager of the large salient-pole generator section of the a-c engineering department of the transportation and generator division. He succeeds **A. M. Goodison,** resigned. In his new capacity, Mr Whitney will be responsible for the design of all large waterwheel-driven generators, synchronous condensers, and frequency changers. Mr Whitney has been with Westinghouse since 1935.

John J. Doyle has been made manager of electronic tube sales for the Lamp Division, Bloomfield, N. J. He succeeds **Adolph Frankel,** recently named manager of the northwestern district of the Lamp Division. Mr Doyle has been identified with Westinghouse since 1926.

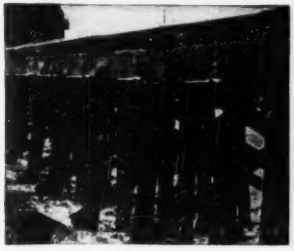
Milton Kalischer has been named manager of the engineering department of the appliance division plant at East Springfield, Mass. Mr Kalischer, who for the past 22 years has been working on the design of Westinghouse appliances, succeeds **Edward R. Wolfert,** re-

KOPPERS CREOSOTE -to be sure!

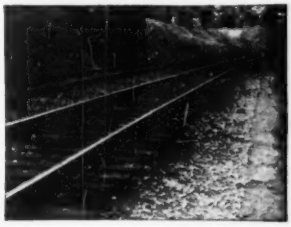
DECKING 14 YEARS This car, with pressure-*creosoted* decking, was sidetracked for its first decking repairs after 14 uninterrupted years of service. Usual life of untreated car decking is about 5 years. Not only did pressure-*creosoting* cut maintenance costs; it prolonged the revenue-producing life of the car.

POLES 30 YEARS On the average, Pressure-*Creosoted* Poles have a life expectancy of more than 30 years. Pressure-*creosoting* offers *proved* performance and dependability.

PILES 30 YEARS Pressure-*Creosoted* Piles give unrivalled protection against decay and marine borers. Many *creosoted* marine piling installations are reported sound and serviceable after more than 30 years of use. Pressure-*creosoting* lowers maintenance costs.



BRIDGES 40 YEARS This is one of several pressure-*creosoted* timber bridges which is still in use after more than 40 years. The resistance of pressure-*creosoted* bridges to decay, year in and year out, assures uninterrupted service and low annual replacement costs.



TIES 25 YEARS Pressure-*creosoting* pays off to railroads. The long life of pressure-*creosoted* ties (25 years isn't unusual) has cut replacement costs $88,500,00 annually.

All Standard Specifications
For All Types of Wood Preservation

KOPPERS CREOSOTE

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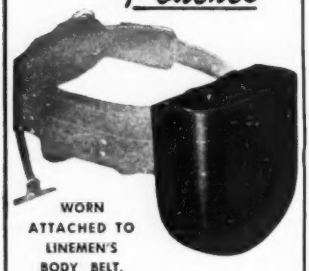
ALL the strength and durability inherent in steel are combined—with definite economies—in *Crapo* Galvanized Steel Strand. Heavy, ductile, tightly-bonded zinc coatings, applied by the famous *Crapo* Galvanizing Process, provide lasting protection against corrosion.

Ask the distributor of *Crapo* Galvanized Products near you or write direct for further information

INDIANA STEEL & WIRE CO.
MUNCIE, INDIANA

Safety Pouches



WORN ATTACHED TO LINEMEN'S BODY BELT.

Keeps screws, bolts and other parts in easy reach and speeds up the job. Sturdy canvas construction. Reinforced top edge to provide easy access. Attaches to the belt by means of web strap loops or snap hook. Top measures 8¼" x 2½"; overall depth 8¾". Other styles available.

Write for Bulletin B-99

IPCO
Safety Equipment for all Industries
INDUSTRIAL PRODUCTS COMPANY
2808 N. FOURTH STREET • PHILADELPHIA 33, PA.

signed. **Graham S. McCloy** has been named to succeed Mr Kalischer as manager of the engineering department's technical development section.

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English Electric Makes Engineering Appointments

Announcement has been made by the English Electric Co, London, England, of the appointment of A. Friswell as general manager of the steam turbine division. A. C. Hirst has been appointed sales manager of the division to succeed R. H. Howatt, resigned, and M. H. Simpson chief sales engineer of the division to succeed Mr. Hirst.

Mr Friswell joined the Rugby Works of the company in 1921 and since 1944 has occupied the position of plant contracts manager, responsible for the handling of all contracts for generating plant, both steam and oil, and electrical equipment for industrial and other applications. Mr Hirst entered the turbine department at Rugby in 1940. His earlier experience was obtained with Brown Boveri in Baden, Switzerland, where he stayed for nine years, and in the London office as mechanical engineer. A subsequent connection followed with the Appleby-Frodingham Steel Co.

Mr Simpson has been with English Electric, turbine department, since 1937.

•

Louis Ruthenburg has been appointed to the newly-created position of chairman of the board and chief executive officer of Servel, Inc, Evansville, Ind., in recognition of his important contributions to the company's development since he became president in 1934. **W. Paul Jones** has been named president, general manager, and director. Mr Jones has been in the refrigeration industry 28 years and at one time had been advertising and sales promotion manager of Servel. He resigned as vice-president and director of Philco Corp, in charge of the refrigerator division, to accept his new assignment. Earlier he had been executive vice-president of Fairbanks-Morse Home Appliances and prior to that connection president and general manager of Refrigeration Products Co, Evansville.

Thomas A. Kennally has been appointed president of the refrigeration division of the Philco Corp, Philadelphia. Mr Kennally is a Philco veteran with 25 years of experience in the development, manufacture, and distribution of Philco products. For the past six months, he has devoted most of his time to the newly-acquired electric range division of Philco and its integration with other company operations.

Arrow-Hart & Hegeman Assigns New Sales Duties

Announcement has been made of five promotions and additions in the sales department of the Arrow-Hart & Hegeman Electric Co, Hartford, Conn. They are Howard J. Varley, sales manager of appliance division, promoted to assistant director of sales of the entire company; Gordon Britt, appointed to succeed Mr Varley as sales manager of appliance division; P. T. Galt, Jr., appointed manager of the industrial controls division; Charles H. Tuttle, sales manager; and John C. Ellis, assistant sales manager of the latter division.

Mr Varley has been associated with Arrow-Hart & Hegeman since 1937. Joining the organization in 1934, Mr Britt has held positions in the advertising, production, and service departments, as well as in the appliance division. Since joining the company in 1926, Mr Galt has spent much of his time in the specialty appliance switch division. Mr Tuttle has been connected with the company for more than 23 years, directing his attention particularly to engineering and sales work. Since 1945 Mr Ellis has been a salesman in the New York office.

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H. G. Downey, manager of the Tri-County Electric Cooperative, Mt Vernon, Ill., was elected president of the Managers Association of the Illinois Electric Cooperatives at its recent annual meeting in Springfield.

Leslie W. Nims has retired as personnel director of the Utah Power & Light Co, Salt Lake City. Mr Nims had served the utility for 42 years in both Utah and Idaho. He will make his home in Lanikai, T. H. In 1940 Mr Nims was named UP&L military liaison officer to assist war establishments in making full use of regional power facilities. He was made personnel director in 1944.

OBITUARY

Thomas R. Dobson

Thomas R. Dobson, vice-president in charge of sales of the Jersey Central Power & Light Co, Asbury Park, N. J., died on Sept 18 at his home in Long Branch of a coronary thrombosis. He was 49 years old.

Mr. Dobson went to the Jersey Central Power & Light Co in 1945 from Altoona, Pa., where for a number of years he had been associated with the Pennsylvania Edison Co, now Pennsylvania Electric Co. He started with the Altoona properties as a cadet engineer in 1919, while a student in the electrical

engineering school at Pennsylvania State College, and then became regularly affiliated with the company. He was transferred to the new business department in 1922 as a power sales engineer and continued in that position until 1937, when he was made manager of power sales. In 1939 he was made new business manager and two years later was appointed commercial manager in charge of commercial activities and industrial sales. In 1945 he was made a vice-president.

As vice-president of Jersey Central Power & Light, Mr Dobson directed all sales activities of the company and, in addition, was in charge of rates, and all commercial offices.

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Edgar R. Crofts

Edgar R. Crofts, a vice-president of the Rochester (N. Y.) Gas & Electric Corp, died on Sept 9 in that city after a short illness. He was 61 years old.

Mr Crofts had been with the Rochester utility for more than 30 years. After holding various positions, including that of purchasing agent, he was appointed general superintendent of the electrical department, and in 1944 he was made vice-president in charge of electric operations. Two years later he was made head of all operations, electric, gas and steam, as well as of the purchasing, maintenance, and engineering departments.

•

A. Donald Cummings, 45, for the past 13 years chief chemist of the Collyer Insulated Wire Co, Pawtucket, R. I., died in Providence on Sept 1. He was with the U. S. Bureau of Standards from 1929 to 1932 and with the American Steel & Wire Co, Worcester, Mass., for four years.

Arthur G. James, 50, city planning engineer of Palo Alto, Calif, died Aug 24 of complications resulting from leukemia. A graduate of Stanford University with both a civil and an electrical engineering degree, Mr James spent two years with the Great Western Power Co, Sacramento, before becoming assistant city engineer for Palo Alto. After engaging in consulting civil engineering work in Palo Alto he became planning engineer.

Charles K. Steinmetz, district manager of the Pennsylvania Power & Light Co at Carlisle for 20 years, died on Sept 7 in that city. He was 57 years old. Associated with the company in Harrisburg in various capacities, beginning as an electrical engineer in 1914, Mr Steinmetz went to Carlisle in 1929.

THE T.J. Cope INC. REPORTER

Written by Edgar W. Baird, Jr., President T. J. Cope, Inc., Philadelphia, Pennsylvania

Improved products—simplified operation—better results! Now you know I'm back on my favorite subject: Labor Saving and Cost Reduction. There isn't a day goes by in our plant that we don't all strive to find a better way to produce a better product at a lower cost. The same thing that's going on in "Cope's" office and plant is undoubtedly going on in your own engineering and construction departments.

Wherever our sales engineers visit these days, this question is put to them: "What can you people at Cope suggest in the way of a tool that will help us overcome this problem which has for years cost us too many man-hours and too much material?" And it's this continually repeated question that has gotten all of us at COPE into the habit of watching, thinking and working for new ideas.

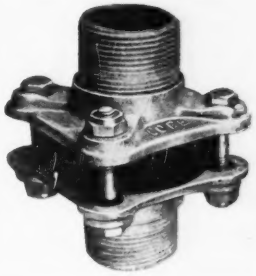
Where new ideas come from is always an interesting subject. Many come from our customers, as I have just said, but the one I'm going to talk about came from watching a ceiling fan in a small restaurant near our plant.

The COPE LEVELIZER is a brand new idea. It is that vitally important unit between the Street Lighting Bracket and the Luminaire which, with its precision adjustment, will bring the Luminaire into direct horizontal line even though the bracket might be off plumb. We call it "Levilizer", some call it "Plumbizer", and others undoubtedly have other words for it.

We have compared the COPE LEVELIZER with the others on the market and are proud to claim that it is less complicated—less cumbersome—more effective—more easily adjusted—and considerably cheaper.

The illustration shows what we call "the ultimate in simple perfection" — a unit measuring 3" x 3" x 2½" consisting of two malleable iron flanges separated by a resilient gasket of Neoprene and adjusted by four bolts with locknuts. Nobody today in the utility field has to be told of the long-life, weather-resisting qualities of

The COPE Levelizer



Neoprene — hot dipped galvanized iron and steel are standard throughout the industry. That's all we have in this unit.

The whole unit is so simple, so easy to adjust and so reasonable in price that when we showed our first experimental sample to one of the largest utilities in the country, they sat down and wrote us an order for a thousand. We don't expect everybody to give us an original order like this, but if you'll write us for our circular and prices, I think that any of you that have a street lighting problem would at least be interested in a sample order.

May I hear from you?

Many thanks,

E. W. Baird Jr.

President

T. J. COPE, Inc.

711 S. 50 St. Philadelphia, Pa.

MANUFACTURERS and MARKETS

FRENCH heavy electrical machinery manufacturing group exchanges greetings with Pennsylvania Transformer Co officials during ECA tour through company's plant in Canonsburg last week. Standing (l to r) are Henri Noel, leader of the French group; E. S. Glenn, State Department interpreter; W. E. Kerr, president, Pennsylvania Transformer; A. L. Horelick, engineering manager; W. S. Swoish, vice-president and I. R. Isaccs, advertising manager. The company recently completed taking over additional factory space at the Canonsburg plant, which gave Pennsylvania a total of approximately 500,000 sq ft of floor space

Pennsylvania Transformer Entertains French Group

Pennsylvania Transformer Co was host on Sept 12 to a group of 17 representatives of France's heavy electrical machinery manufacturing industry at the company's plant in Canonsburg, Pa. This group, the first to come to the United States from France under auspices of the ECA-Technical Assistance Program, is to study and observe modern production methods and industrial employee relations as employed by American manufacturers in achieving our high rate of productivity.

The group is under the supervision of William F. Sweeney, project manager, arrangements branch, technical assistance division, ECA. W. E. Kerr and W. R. Swoish, president and vice-president of Pennsylvania Transformer, greeted the group on their arrival at the plant. M. Henri Noel, representing the French Manufacturers Association of Heavy Electrical Industries, spoke for the group. The 17 Frenchmen and three State Department interpreters then were taken on a comprehensive tour of the factory.

After lunch, a panel discussion was held in the company's conference room to assist the French visitors in obtaining the information they are seeking. Following a general question and answer period, the group split up into four sections to discuss production methods, scheduling, engineering, and job evaluations. Company officials who took part in this discussion were: W. R. Swoish, vice-president and sales manager; F. L. Huber, personnel manager; A. L. Horelick, engineering manager; O. Hopf, plant superintendent; E. P. Zimsky, production manager and J. J. Zimsky, chief mechanical designer. Also included were Lynn Culp and Mike Leson, CIO officials, who represented company workers.

Tentative itinerary for the remainder of the study tour includes visits to Westinghouse, General Electric, the Elliott Co, Crocker-Wheeler, and the Buffalo Niagara Electric Co. They will also spend several days in Washington, meeting with various government officials.

Trumbull Electric Makes Plans for Anniversary

Plans for the celebration of its fiftieth anniversary have been announced by the Trumbull Electric Manufacturing Co, Plainville, Conn. As a tribute to the founders, John and Henry Trumbull, who, with Frank T. Wheeler and Stanley S. Gwillim, actively managed the company's affairs for 45 years, a golden anniversary celebration program has been planned for the next four months. The main objective set for achievement during the celebration period was described by President E. T. Carlson in a personal letter to employees as the "return to full employment at all locations and to provide for future job security."

A highlight of the celebration will be an open house on Oct 12 open to the general public, during which guests will be taken on tours through the plant. Displays will be set up in each department, showing the type of work performed there.

Another feature will be the fiftieth anniversary suggestion contest which will run from Sept 1 to Nov 30. The contest will be open to all employees and cash prizes totaling $450 will be awarded for the best suggestions submitted.

MANUFACTURING BRIEFS

ECA has issued a new booklet designed to assist American small businessmen who plan to enter the export market under the Marshall Plan. The booklet explains the various methods of organizing for overseas trade, listing the advantages and disadvantages of each method. In July ECA issued a booklet entitled "Information for American Businessmen on the Marshall Plan."

The Seventeenth British Engineering and Marine Exhibition surpassed all former records for size and display when it opened in London on Aug 25. More than 500 firms occupied the entire floor space of the vast Olympia Exhibition Hall (close to 250,000 sq ft), an increase of 25% over the last exhibition

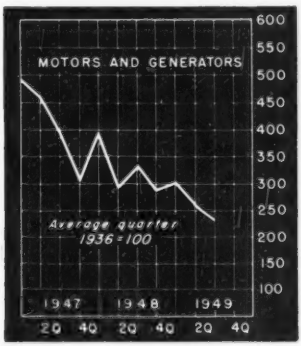
held in 1947. Exhibits showed a cross-section of the plant, equipment, accessories, and other products of Britain's electrical, mechanical, and marine industries. The exhibition closed Sept 10.

Extension of application engineering services to European users of its electric motor drives and related equipment has been announced by the Reliance Electric & Engineering Co, Cleveland, with the dispatch abroad of Clarence J. Marx to establish headquarters for such technical services in England. "Immediate responsibilities of Marx," said E. E. Helm, Reliance sales vice-president, "will be to supervise the 'tune-up' of Reliance equipment on projects now going into operation in England, France, Sweden, Austria, Italy, and Belgium. In addition, he will be available to assist foreign representatives of American machinery manufacturers who have electrical equipment problems to be solved."

Associated Electrical Industries, Ltd, and General Electric Co, Ltd, have formed a new company called Glass Bulbs, Ltd, with a capital of £1 million. This new company is erecting buildings at Harworth, in Yorkshire, and will install in them two ribbon machines for the production of electric lamp bulbs, according to *McGraw-Hill World News*.

Motor-Generator Orders Drop 8% in 2d Quarter

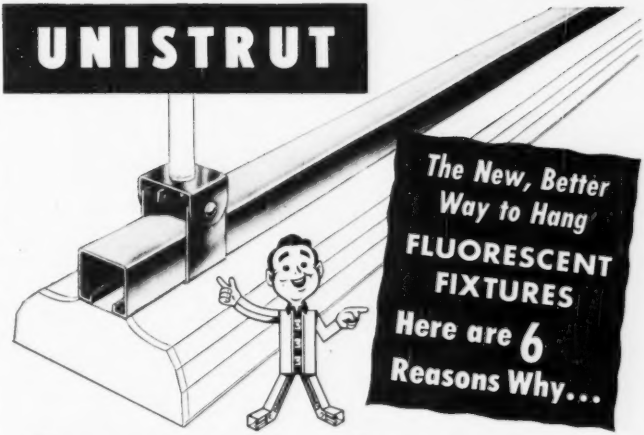
Orders received for motors and generators during the second quarter of 1949 dropped sharply, according to



figures released by the National Electrical Manufacturers Association. The index compiled by NEMA moved downward to 240 from 262 in the first quarter of the year. This represents an 8% decrease. The decrease from the corresponding quarter of 1948 was 27%.

No adjustment has been made for cancellation or renegotiation.

UNISTRUT



1 Fewer Hanger Stems and Canopies

Unistrut's great channel strength permits wider spacing of stems—up to 15 ft. apart if desired, but a better appearing installation and obvious savings.

2 Perfect Alignment

Unistrut channel is rigid, strong and perfectly straight—gives you true alignment of fixtures. Cleaning, re-lamping or other servicing cannot disturb this alignment.

3 Completely Flexible

Stems or rods can be installed at *any* point along Unistrut channel to overcome possible ceiling irregularities or obstructions. Ideal for continuous runs or intermittent spacing of fixtures.

4 Faster, Easier Installation

Unistrut channel and fittings are attached to fixtures quickly and easily at normal working height or at suspension level. No drilling, no welding, 100% adjustable.

5 Added Safety

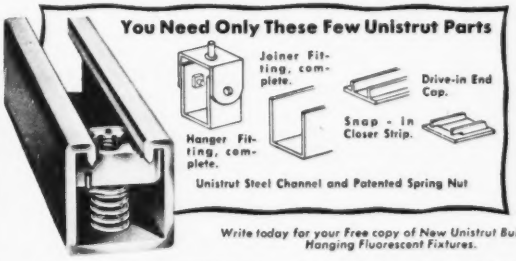
Unistrut assures the utmost safety of installation because an entire row of fixtures becomes a single integrated unit—added safety obtained by no other method.

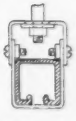
6 Saves Time and Money

Reduces number of canopy and stem sets used, lowers wiring and rewiring costs, eliminates drilling and welding costs, saves planning and installation time.

Fully Tested and Proved by Contractors — on Thousands of Installations Demanding the Finest in Lighting!

You Need Only These Few Unistrut Parts


Joiner Fitting, complete.
Drive-in End Cap.
Snap - in Closer Strip.
Hanger Fitting, complete.
Unistrut Steel Channel and Patented Spring Nut



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The New 1000-lb. Mighty Midget Puller

Combining easy portability with added pulling power, the new Coffing Mighty Midget does *more* jobs, does them *easier*. Only 9½ lbs. in weight, it hangs easily on a lineman's tool belt. Full half-ton capacity gives it plenty of power for stretching long spans of wire, raising heavy equipment, tightening guys — many other pulling and lifting jobs. Convenient 2-way handle serves as a lever or high speed crank.

Equip your crews with these new, stronger mighty midgets. See how their added strength and tool-belt portability speed maintenance and new construction. Write for Bulletin EMP9.

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DANVILLE, ILLINOIS

HOW TO MEASURE INSULATION RESISTANCE

To obtain a proper megohm reading of insulation resistance, it is necessary to provide a constant high voltage DC potential which will produce sufficient current flow through the resistor under test to actuate a means of indication.

VIBROTEST
Model 201
Range 0-200 Megohms at 500v potential.
150 - 300 - 600 volts AC or DC.)

VIBROTEST'S EFFORTLESS *Battery-operated* power supply is the *only positive*, "push-button" means of obtaining *constant* high voltage for accurate insulation resistance measurement. Tiresome, inaccurate CRANKING ELIMINATED; NO LEVELLING; NO ERRONEOUS READINGS due to surface leakage; NO SHOCK when disconnecting; EASY SCALE READING in ohms, megohms, AC or DC voltage; ACCURATE in −40° to 110° F. MEASURES resistance values of insulation, windings, armatures; test wiring continuity, connections; checks for shorts, leaks, opens; tests power source voltage, AC or DC—10 models covering entire range of resistance measurement from 100 to 50,000 megohms.

Valuable information on Insulation resistance measurement. Contains handy reference chart showing proper ranges for general laboratory and field testing; for general industrial testing and for Research testing. WRITE for it, or use inquiry card.

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NEW ELECTRICAL CONSTRUCTION

NEW ELECTRICAL construction projects announced by private and government utility systems involving more than $70,000. Also listed are major industrial and construction jobs where electrical work is included

UTILITIES

Proposed Construction

Arizona—Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo., outdoor distr. transformers, outdoor current transformers, outdoor potential transformers, outdoor disconnecting switches for Mesa substation, Davis Dam Proj., Spec. 2784, L. N. McClellan, ch. engr.

California—Bureau Reclamation, Box 2511 Sacramento, steel towers for 230-kv transmission lines, Shasta-Tracy West Side Lines, double circuit steel towers for Central Valley Proj. R-2-74. Plans deposit $2.

California—Bureau Reclamation, Dpt. Interior, Elverta, 230-kilovolt transmission lines Perkins to Tracy and Oroville to Elverta, Central Valley Proj., Spec. 2781.

Florida — Clay Electric Co-operative, Inc., Keystone Heights, 137.4 mi. rural distr. lines, Clay Co., **$137,000.** E. P. McLean Eng. Co., 815 S. Main St., Moultrie, Ga., engr.; 170 mi. rural distr. line and sys. imprvs., Clay Co. **$585,000.**

Ill., Peoria—Central Illinois Light Co., 316 S. Jefferson Ave., R. S. Wallace plant addn. **$8,500,000.**

Ind., Frankfort—Bd. P. Wks., A. Rogers secy., City Hall, 1 story, bsmnt., 28x84 ft., brick, rein.-con., steel municipal power plant addn. $100,000. Plans deposit $10. Emery, Marker & Emery, 510 Toledo Trust Bldg., Toledo, O., consult. engrs.

La., DeRidder—Beauregard Electric Co-operative, DeRidder, warehouse and office. Plans deposit $25. George C. Hengy & Co., 1007½ Texas Ave., Shreveport, engrs.

Minn., Worthington—City, G. S. Thompson, clk., municipal power plant, steam generation unit, $100,000. Pfeifer & Schultz, 702 Wesley Temple Bldg., Minneapolis, engrs.

Mississippi — Southern Pine Electric Power Assn., Taylorsville, 350 mi. rural distr. lines Smith Co. **$350,000.** Bowman & Bowman, Box 518, Greenwood, engrs.

Miss., Bay St. Louis—Coast Electric Power Assn., Bay St. Louis, warehouse and office, $90,000. Biggs, Weir & Chandler, 224 N. Congress St., Jackson, archts.

Missouri—Lawrence-Ozark Electric Co-operative, Mount Vernon, 325.32 mi. rural distr. lines and 111.5 mi. conversion in Dade, Greene, Jasper, Lawrence, Christian Barry and Stone Counties, **$400,000.** Frank Horton & Co., Lamar, engrs.

Montana—Fergus Electric Co-operative, Lewistown, 73 mi. rural distr. lines, Fergus Co., from Line Builders Inc., Billings, **$71,709.**

N. Y., New York—Bd. Transportation, 250 Hudson St., Zone 13, Contr. 1 general contract, Contr. 2 plumbing Brady and Allerton substations, circuit breaker house and signal tower for Dyre Avenue Line, Bronx Boro.

Okla., Perry—City, City Hall, 900 kw. engine-generator unit, city power plant, **$190,000.**

South Carolina—Harry Electric Co-operative, Inc., Conway, 75 mi. rural distr. lines, sys. imprvs., Harry Co. **$125,000.**

Tennessee—Johnson City Power Bd., Johnson City, 260 mi. rural distr. lines, Carter, Greene, Sullivan and Washington Counties. Plans deposit $25. McWhorter & Sullivan, 253 Franklin St., Nashville, engrs.

Tex., Bryan—City, Roland C. Dansby, mayor, City Hall, voted **$150,000** bonds, addnl. electrical distr. sys. Thomas Bryan & Assoc., M. & M. Bldg., Houston, consult. engrs.

Wyoming—Big Horn Rural Electric Co., Basin, 20 mi. rural distr. lines, sys. imprvs. and construction previously approved construction, Big Horn Co., **$375,000.** H. S. Nixon Eng. Co., WOW Bldg., Omaha, Neb., consult. engr.

Wyoming—Bureau Reclamation, Casper, misc. power and control cabinets for Kortes Power Plant, Missouri River Basin.

Low Bidders & Contracts Awarded

Ill., Chicago—Commonwealth Edison Co., 72 W. Adams St., Zone 3, electric power substation, 1141 W. Diversey Parkway, Zone 14, to Paschen Contractors, Inc., 2739 N. Elston St., Zone 47, **$144,000.** Awarded 9/6. Shaw Metz & Dolio, 208 S. La Salle St., Zone 4, archts.

Nebraska—Wheat Belt Electric Membership Assoc., Sidney, approx. 621.62 mi. rural distr. lines, Cheyenne, Deuel, Garden and Morrill Counties, to Gohs & Hon Constr. Co., Horton, Kan., **$518,500.** Bids 9/1, awarded 9/7.

Oklahoma—Cotton Electric Co-operative, Walters, 229.13 mi. rural distr. lines, Cotton Co., to W. J. Thomas & Co., Inc., P. O. Box 7006, Dallas 9, Tex., **$247,074.**

Oklahoma—Tri-County Electric Co-operative, Inc., Hooker, 540.52 mi. rural distr. lines, Texas Co., to Kennett & Pavlicek, Box 1305, San Angelo, Tex., **$629,013.** Carl C. Cox, 315 Barfield Bldg., Amarillo, Tex., engr.

South Dakota—Central Electric Co-operative, Blunt, Aug. 30, 434 mi. rural distr. lines, Hughes Co., from Philard, Inc., Huron, **$507,309.**

South Dakota—Turner-Hutchinson Electric Co-operative, Marion, 210 mi. rural distr. lines, Sect. 2, and 230 mi. Sect. 1 Turner Co., to Franzen Bros., Palisades, Minn., **$515,470.** Bids 8/26.

Tex., Port Arthur—Gulf States Utilities Co., Port Arthur, transformer sub-station. Owner builds. Approx. **$100,000.**

INDUSTRIAL, COMMERCIAL & PUBLIC BUILDINGS

Proposed Construction

Calif., Corona—State Div. Architecture, P. Wks. Bldg., Sacramento, plans by Gordon B. Kaufmann & J. E. Stanton, 627 S. Cardonelet St., Los Angeles, women's prison, **$3,600,000.**

Colo., Denver—University of Colorado Medical Center, c/o Bd. Regents, Boulder, 5 story, bsmnt., L-shaped, 101 ft. and 44x114 ft. cancer research wing, $558,000. Fisher & Fisher, 837 Denver National Bank Bldg., Denver, archts. and engrs.

Conn., Hartford—City of Hartford, Hartford Housing Auth., 846 Asylum St., 2000 frame dwelling units garden apartments. **$16,000,000.**

Del., Wilmington—Clifton Park Manor Inc., Du Pont Bldg., plans by A. D. Lueders, 1513 N. Uhles St., Arlington, Va., 920 unit apartment development, Governor Printz Blvd. **$5,924,000;** Clifton Park Apartments, Edgewood Section, **$6,000,000.**

Ill., Chicago—University of Illinois, Urbana, 14 story, brick, steel, stone research and education hospital addn. $9,000,000. Holabird & Root & Burgee, 180 N. Wabash St., archts.

La., New Orleans—New Orleans Housing Auth., 226 Canondelet St., (1st unit) 2,500 rental housing units, **$21,875,000;** (2nd unit) 2,500 rental housing units, **$21,875,000.**

Mass., Brocton—U. S. Eng., Army Base, Boston, Mass., veterans hospital, Infirmary, continued treatment bldgs., recreation bldgs., theatre, gymnasium and swimming pool accommodations for attendants and utility group, Belmont St., for Veterans Admin., Vermont Ave. between H and I Sts. N. W., Wash. 25, D. C. **$17,000,000.**

Mass., Lowell—City of Lowell Housing Auth., J. McFadden, exec. dir., 582 Market St., 292 unit garden type veterans housing, Gorham St., $2,900,000. Plans deposit $100. Krokyn & Browne, 184 Boylston St., Boston, archts.

N. M., Santa Fe—State, Capitol Bldg., Unit 1, state office. Total est. $4,000,000. W. C. Kruger Co., 71 Sena Plaza, engr. and archt.

N. Y., New York—New York Infirmary, 535 Fifth Ave., Zone 17, plans by Skidmore, Owings & Merrill, 5 E. 57 St., Zone 22, 11 story aluminum and glass front hospital, 321 E. 17 St. **$4,050,000.**

N. Y., New York—Herbert J. Freezer, 200 Fifth Ave., Zone 10, plans by John Sloan Assoc., 420 Lexington Ave., Zone 17, 20 story office, on block bounded by 51 and 52 Sts., 7 Ave. and Broadway. **$9,000,000.**

Pa., Phila.—Phila. Housing Auth., 21 and Winter Sts., 10,000 housing units, **$80,000,000.**

Tex., Austin—Austin Housing Auth., 302 Chalmers St., 520 low rental housing units. **$4,550,000.**

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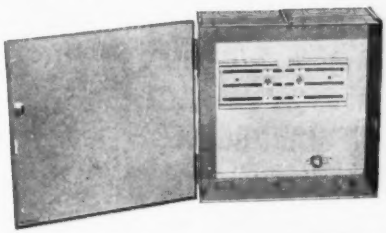

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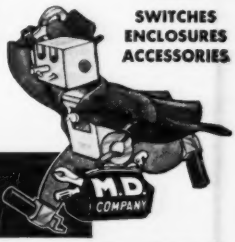

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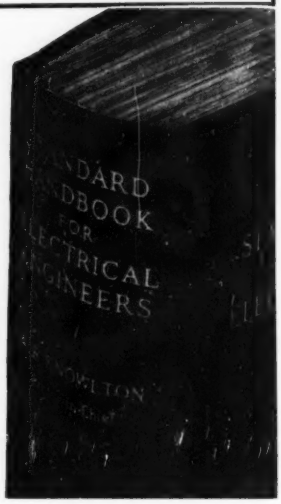

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RECENT RATE CHANGES

Consumers Power Co hearings covering electric rate increases of $6,600,000 a year from its 600,000 customers are expected to be resumed before the Michigan Public Service Commission in October. The company at hearings in February said that 17% of the requested rate increase for electricity would come from residential customers and the boosts in their bills would range from 7.4 to 15.4%. Then a recess was ordered by the commission to permit a study by engineers and accountants on the staff of the commission.

Alexander City, Ala., city council has authorized a revised rate schedule for residential users of electricity, which will effect a saving of more than $6,000 annually for this classification.

Michigan Public Service Co's interim electric rate increase, totaling $226,000 annually, has been made permanent by the State Public Service Commission. The company asked for the rate boost in March, claiming that its expenses had outstripped its income. The interim increase was granted soon after to keep the company solvent until hearings coud be held.

Wisconsin-Michigan Power Co has been given a $431,549 a year electric rate increase by the Wisconsin Public Service Commission. The company had asked for an increase of $657,350. The commission approved rate increases for the company's residential, rural, off-peak water heating, and small commercial and industrial consumers. It held up changing rates for large customers since a proceeding now is pending before the FPC that might affect them.

•

OTS Continues Technical Information Services

Aid to small businesses in the form of reproduced technical reports, a journal of abstracts, and a weekly newsletter will be continued by the U. S. Department of Commerce. Announcement by the department's Office of Technical Services indicates that it is hoped to serve firms that do not have their own laboratories or elaborate technical facilities as well as to broaden interest in federal technology.

Subscription to **Bibliography of Technical Reports** (in abstract) has been reduced to $5 per year. The **Newsletter** highlighting business opportunities arising from federal research goes with it or is obtainable separately at 50¢ per year. Mimeographed, photostat, or microfilm copies of the full reports will be available at prescribed prices.

Meanwhile a microfilm rapid selector has been developed to photograph subject matter of any desired nature by punch card procedure in connection with a microfilm which has been indexed to correspond.

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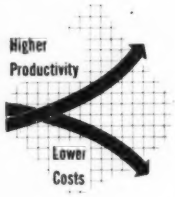
Electrical World's "Cost-Cutters" are coming October 22



30 pages will carry 150 or more short items. Widely diversified, terse, sharp, factual: each *tells*, in plain words, a method that saves money in a construction, operating, maintenance or administrative job. Each item *shows* by picture, diagram or chart, how to cut costs.

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You'll want to read and re-read this story. The date, remember, is October 22.

CATALOGS • BULLETINS

● LIGHTING FIXTURES: Bulletin 50-G covers a new listing of Viz-Aid fixture. These shielded units for two 40-w fluorescent lamps are specifically designed for classroom lighting installations. Bulletin No. 50-J covers a complete listing of new surface mounted accent lighting units for both adjustable spots or floods and fixed Holophane Controlens. Day-Brite Lighting Inc, 5411 Bulwer Ave, St. Louis 7, Mo.

● INSTRUMENTS: A description and the theory of a portable, ultrasonic instrument for measuring thickness of materials from one side only, is given in Bulletin 3700. It includes general application of the instrument to non-destructive measurements of plate and sheet stock, formed parts and assemblies of various metals and plastics up to 4 in. in thickness. Other uses of the Reflectogage described in the bulletin are tests for lack of bond, lamination and internal defects in sheet stock. Sperry Products, Inc, Danbury, Conn.

● MANHOLES AND DUCTS: Catalog No. 30 describes lightweight flexible hose products specifically designed for dust collection, fume control and ventilation. This 12-page publication gives the important features of the equipment, installation data, with illustrations, and general information and engineering data. American Ventilating Hose Co, 15 Park Row, New York 7, N. Y.

● MOTORS: Bulletin PB 5000-1, on Fabri-Steel, low-speed, synchronous motors, covers construction features of the rotor and stator, and mechanical modifications. Elliott Co, Ridgway Division, Ridgway, Pa.

● CONTROLS: How the VSC electronic excitation control system provides functional adaptability for production or processing operations requiring timed-rate, smooth acceleration and deceleration is concisely explained in a two-page bulletin, K-2025. Reliance Electric & Engineering Co, 1111 Ivanhoe Road, Cleveland 10, Ohio.

● RESISTORS: Bulletin 1032 describes new, corrosion-resistant, alloy resistors, for use with Youngstown Safety Limit Stops, to stop d-c crane-hoists quickly by dynamic braking. This eight-page bulletin contains the standard features of the equipment, with illustrations, and operation data. The Electric Controller & Mfg Co, 2700 East 79th St, Cleveland 4, Ohio.

● LIGHTING: An eight-page catalog illustrates and describes in detail the new Series-Louver Slimline Luminaires for commercial and industrial interiors. The publication also gives dimensional details and illumination performance in various size areas. The Miller Co, Meriden, Conn.

● CUTOUTS: Bulletin 101-C describes by illustrations, tables and text the outstanding features of Protectolink cutouts and reclosers. The performance of types XL, OK and HQ fuswitches are described in Bulletin 103-S, with tables giving detailed results of tests on equipment. Also included in this 12-page bulletin are descriptions of three porcelain-housed fuswitches and cutouts. W. N. Matthews Corp, St. Louis 16, Mo.

● CABLE SUPPORTS: Publication 4901 gives the outstanding characteristics of spool insulator cable supports. Included is a table, listing cable characteristics and percent voltage drop. Delta-Star Electric Co, 2400 Block, Fulton St, Chicago 12, Ill.

● ALLOYS: Extrusion and its contribution to better brazing is discussed in a 15-page booklet, B-4198, on extruded Phos-Copper. Eight methods of brazing with Phos-Copper are described—gas brazing, dip brazing, incandescent carbon brazing, electric furnace brazing, high frequency induction, arc torch brazing, carbon arc, and spot welder. Sizes and shapes of Phos-Copper, and also Brazaid No. 1 Flux and Fluxine paste are pictured and described. Westinghouse Electric Corp, P. O. Box 868, Pittsburgh, Pa.

LETTERS TO THE EDITOR

Data on Diesels

To the Editor of ELECTRICAL WORLD:

I have to draw your attention to a very serious error on page 60 of the ELECTRICAL WORLD dated July 16th, 1949.

In the article on diesel economy you speak of the ASME Sub-Committee on oil engine power costs and state that "there is no other comparable source of data about diesel engine operating costs and operating characteristics."

I would draw your attention to the fact that an organization named the Diesel Engine Users' Association was founded in England 36 years ago. This organization has collected and published data relating to the cost of operating and maintaining diesel power stations in all parts of the world.

While full credit should be given to the ASME Sub-Committee for its work in connection with diesel plant, I feel that the work of the parent organization should not go unrecognized.

B. S. Seymour
Superintendent Engineer
The Bermuda Electric Light, Power & Traction Co, Ltd
Pembroke, Bermuda

Congratulations

To the Editor of ELECTRICAL WORLD:

I took up your ELECTRICAL WORLD for May 21st and could not put it down—so interesting!

Warm congratulations.

Major A. M. Taylor
Economic Transmission Ltd
Birmingham, England

TECHNICAL LITERATURE

Cable—*Aluminum Cable, Steel Reinforced (ACSR)* is the title of a technical manual which includes data on ACSR, a collection of sag-tension charts, staking tables and stringing-sag tables, and explanatory material on line design and line erection. This manual of more than 300 pages is available to consulting and design engineers and power line owners and operators who request it on his company's letterhead. Requests are to be directed to Customers Service Dept, Reynolds Metals Co, 2500 S. Third St, Louisville 1, Ky.

Insulation Resistance—A 24-page booklet outlines the simplicity of making insulation resistance measurements with a Megger insulation tester. Operating economies and increased production are a part of the story. *For Practical Men* is the title of Bulletin 21P8-9 issued by James G. Biddle Co, 1316 Arch St, Philadelphia 7, Pa.

Cables and Cords—A 32-page bulletin provides construction data on Super Service-S Neoprene Jacketed Portable Cords and Cables, also gives recommendations for splicing and termination of power and shovel cables. Copy is available from General Cable Corp, 420 Lexington Ave, New York 17, N. Y.

Motors—*The ABC of Large Induction Motors* covers the basic theory, operation, characteristics and applications and control of squirrel-cage and wound-rotor motors. Almost 50 graphs with explanatory figures accompany the text. The booklet, Synchronizer 28, is published by Electric Machinery Mfg Co, Minneapolis 13, Minn.

Lighting—Series XIV of IES Lighting Data Sheets when completed in 1949 will consist of 24 sheets and cover installations such as lighting of a combination living-dining room, a subway car, an auditorium, a school classroom, a tower, a kitchen-laundry, a leisure room, a finished goods perch and a sports shop. First seven sheets are available and remainder will be mailed during the year from Illuminating Engineering Society, 51 Madison Ave, New York 19, N. Y.; single subscriptions are $1.25.

Insulation—Manual and catalog of *Fiberglas Glass-Base Electrical Insulating Materials* contains charts, tables of materials and properties, and comparative test data. Copy may be obtained from Owens-Corning Fiberglas Corp, Textile Products Division, 16 E. 56th St, New York 22, N. Y.

Condensers—*Control of Condenser Fouling by Water Treatment* contains a discussion of the mechanical design as well as the supplemental chemical water treatment to assist in keeping a water system clean and free from fouling. This six-page pamphlet, designated AD-46, may be obtained from American Society of Refrigerating Engineers, 40 W. 40th St, New York 18, N. Y., for 40¢.

Metal Surfaces—*Hard Surfaces* is a summary of several methods used to impart hard surfaces to metals. A table classifies the methods described. Copy of the two-page publication may be obtained from Tempil Corp, 132 W. 22nd St, New York 11, N. Y.

Rectifiers—*Miniature Selenium Rectifier Handbook* contains electrical characteristics, circuit applications, voltage-current curves and a chapter, "Fundamental Circuits," covering the basic theory and use of selenium rectifiers. This handbook, priced at 25¢, can be obtained from Federal Telephone and Radio Corp, 900 Passaic Ave, East Newark, N. J.

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WANTED—THOROUGHLY experienced and capable manager for combination gas and electric property located in Southwest. Only men of proven ability with good records of accomplishment need apply. Send complete resume, snapshot photograph, references and statement of present and expected salary. P-9849, Electrical World.

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A large transformer manufacturer in the Middle West has an opening for an engineer experienced in the design and construction of power transformers (above 500 KVA). In answering state previous experience and salary expected. All replies will be handled in strict confidence. Reply

P-9931, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

ELECTRICAL DESIGNERS

ESTABLISHED BOSTON CONSULTANTS HAVE OPENINGS FOR ELECTRICAL ENGINEERS, DESIGNERS AND DRAFTSMEN WITH POWER PLANT AND INDUSTRIAL DESIGN EXPERIENCE.

P-9877, Electrical World
330 W. 42nd St., New York 18, N. Y.

WANTED
RELAY ENGINEER

Minimum of one and one-half years' experience in field work, checking, setting and testing protective relays and associated equipment and control circuits, to work for a large eastern public utility company on protective relay application, relay specifications, short circuit calculations, relay settings, schematic diagrams, and associated work. Location: Western Pennsylvania. Qualifications, experience record, and picture should be submitted with letter of application.

P-9847, Electrical World
330 W. 42nd St., New York 18, N. Y.

SALESMEN — 2

Manufacturer of construction materials for transmission and distribution systems has openings for two experienced salesmen, graduate electrical engineers twenty-eight to forty years of age. Area to be traveled is in the Middle West. Give short transcript of experience and education. Our representatives know of this advertisement. Reply

BW-9908, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

TRANSFORMER MANUFACTURER

Looking for SALES Representation in Philadelphia Area for sale of Power and Distribution Transformers.

RW-9654, Electrical World
330 W. 42nd St., New York 18, N. Y.

Wanted by Manufacturer

Experienced sales agency to handle inquiries and quotations on butt-treated or full-length treated lodgepole pine poles.

RW-9830, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

J. L. HEMPHILL & CO.

ELECTRICAL ENGINEERS & EQUIPMENT

MOTORS SQ. CAGE

1—450 HP.—Ridgeway 900 rpm 2200v.
1—125 HP. G.E., 1800 rpm 2300v.
1—100 HP. Whse. 1800 rpm 440v.
1—100 HP. Whse. 1200 rpm 2200-440v.
1— 75 HP. Whse. CS. 1200 rpm. 2200 volts, 3 phase, 60 cycle.
1— 75 HP. 1800 rpm Westinghouse, 440 volt.
1— 75 HP. General Electric Type KT 900 RPM 440 volt.
2—40 HP. G.E., 900 rpm 220v.
40/30 HP. Westinghouse 600/450 44 volt.

MOTORS SLIP RING

1—2500 HP G.E. MT 257 RPM 6600 volt.
2— 150 HP G.E. Type 1M 450 RPM 440 volt.
1— 100 HP G.E. Type 1M 400 RPM 440 volt.
1— 100 HP G.E. 720 rpm 440v, 25 cy. IM.
75 HP. G.E. 1200 rpm 220v, 60 cy. Vert.
60 HP. West. 900 rpm 2200v. 60 cy. Vert.
50 HP. F.&M. 1800 rpm 220v, 60 cy.

MOTORS—D. C. 230 VOLTS

1—125 HP. G.E. 1800 rpm R.C.
1— 75 HP. 585 rpm General Electric.
1— 50 HP. 700 rpm Crocker-Wheeler.

VARIABLE SPEED—220 VOLTS

1—35 HP. 300/1200 rpm Westinghouse.
1—30 HP. 440/1200 rpm General Electric.
3—25 HP. 450/3200 rpm Westinghouse.
2—25 HP. 300/900 rpm Electric Dynamic.
1—55 HP. 500/1500 rpm General Electric.

MOTOR GEN. SETS

1—1000 KW Westinghouse 275 volt, 720 RPM 4000 volt Syn.
1—1000 KW General Electric 600 volt 514 RPM 4000 Volt Syn.
1—500 KW. G.E. 250v 900 rpm 2300v Syn.
1—500 KW. G.E. 575v 900 rpm 2300v Syn.
1—125 KW. Crocker Wheeler 1200 rpm 125v Generator 2200v S.C. Motor.
1—100 KW. Elect. Mach. 1200 rpm 125v Generator 4150 Syn. Motor.

PLATING GENERATORS

1—1½ KW. G.E. 5/6v with sq. cage mt.
1—12 KW. Hansen Van Winkle 24v 1200 rpm. 20 HP. General Electric KF Motor.
1—3000 Amp. Chandeysson, 6/12v 400 rpm Syn. Motor.
1—2500 Amp. ditto.
1—625 KVA West. Reduction Gear Turbo Generator Non-Condensing, 2400v 3 ph 60 cy.

TRANSFORMERS

1—1000 KVA G.E. 3 ph. 4150 volt to 2400 volt.
3— 400 KVA G. E. 6900 V. Pri.—2300 V. Sec.
3— 300 KVA Pitts. 2300v pri. 115/230v sec.
3— 300 KVA G.E. type H. 2300v pri. 115/230v sec.
3— 150 KVA West. 2300 volt Pri. 240/480 sec.
1— 150 KVA G.E. 2300v 110-220v.
3— 100 KVA G.E. 4150v. 240/480v. Pyranol.
3— 100 KVA G.E. 4150 v 230/460 v Pyranol.
3— 75 KVA Amer. 2400v. pri. 240/480 sec.
6— 50 KVA West. 2300 v. 120/240 v. Insetsen.

ALTERNATORS & SYNCH. MOTORS

1—2500 KVA Westinghouse, Syn. condenser, 720 rpm 2200v with D.C. exciter.
1—320 KVA Allis Chalmers, 450 rpm 480v.
1—240 KVA General Electric ATB, 600 rpm 240v with D.C. exciter.
1—223 KVA 514 rpm 600v Westinghouse.
4—200/100 HP. Whse. 720/360 rpm 4150v
1—200 HP. General Electric 257 RPM 440 volt.
1—100 HP. G.E. type TS 600 rpm 4400v D.C.
2—150 HP. Allis Chalmers, 360 RPM. 2200 volt.

Complete Line of A.C. and D.C. Motors and Generators

TRANSFORMERS
FOR SALE

3—500 KVA A-Ch 33000—2300
3—500 KVA G-E 2400—240/480
1—400 KVA G-E 13200—120/240
3—333 KVA G-E 33000—2300/4000Y
3—333 KVA G-E 13800—120/240
6—333 KVA A-Ch 12000—600
2—200 KVA G-E 6900/11950Y—460/230/115
3—150 KVA G-E 22000—2300/4000Y
3—150 KVA G-E 11000—2300/4000Y
3—150 KVA G-E 6600—220/440
3—150 KVA L-M 2400/4160Y—120/240
2—150 KVA A-Ch 2400—120/240
2—100 KVA G-E 33000—2300
3—100 KVA G-E 11000—2300/4000Y
6—100 KVA G-E 11500—230/460
3— 50 KVA G-E 33000—2400/4160Y
3— 50 KVA Pitts 26400—2300/4000Y
3— 50 KVA W-H 4800/8320Y—120/240

Many other itmes in stock

TRANSFORMERS WANTED

Reliable rewind and repair service on all makes of transformers

THE ELECTRIC SERVICE CO.
Mariemont & Trade Sts.
Cincinnati 27, Ohio

FOR SALE

3-Clark Automatic Air Dump Cars

manufactured in 1923. Capacity 100,000#, 810 cu. ft. weight 58,600#, Length 32'2", width 9'1½", Westinghouse draft gear, coupler shank 6 x 8 C.S., yoke 6 x 1½ key, A.R.A., brake beams #2, K-2-triple, rolled steel wheels. Useable condition.

Contact N. C. STIREWALT, *Vice President*

CENTRAL ILLINOIS PUBLIC SERVICE CO.
ILLINOIS BUILDING, SPRINGFIELD, ILLINOIS

TRANSFORMERS *FOR SALE*

12—1000 KVA G.E. Pri. 2300 to 13200 Sec. 230 to 2300, 1 Ph. 60 Cy.
9—300 KVA West. Pri. 2300 to 13200 Sec. 230 to 2300, 3 Ph. 60 Cy.
3—75 KVA G.E. Pri. 2300 Sec. 230/115, 1 Ph. 60 Cy.
2—150 KVA Elster Pri. 2300/4600 Sec. 230/460 3 Ph. 60 Cy.
3—150 KVA G.E. Pri. 2300/4000Y Sec. 115/230 1 Ph. 60 Cy.
3—100 KVA G.E. Pri. 6900/11950Y Sec. 230/460 1 Ph. 60 Cy.
1—1000 KVA West. Pri. 2300/13200 Sec. 230/2300 3 Ph. 60 Cy.

PARTIAL LISTING — SEND US YOUR INQUIRIES — WE HAVE IT. TRANSFORMERS BUILT TO YOUR SPECIFICATIONS. REPAIRED AND REWOUND.

BUFFALO TRANSFORMER CO.
1513 Niagara St. - Grant 2716 - Buffalo 13, N. Y.

New and Used Equipment Available for
POWER PLANTS, SUBSTATIONS, TRANSMISSION LINES AND CONSTRUCTION
Send for new list to
EBASCO SERVICES INCORPORATED
APPARATUS EXCHANGE 120 Wall St., New York 5, N. Y.

FOR SALE
500 Used Fractional Horse Power DC Motors.
500 Used Thompson Watthour Meters.
One (1) 1000 HP Diesel with 325 V. 2000 A 315 RPM DC Generator.
ST. THOMAS POWER AUTHORITY
ST. THOMAS, U. S. VIRGIN ISLANDS

USED PAPER & LEAD CABLE

Available

3/0 - 4C - 5 KV

17,500 ft. round—
Lengths 446' to 104'
9,400 ft. sector—
Lengths 542' to 116'

Mail inquiries for details to

KANSAS CITY POWER & LIGHT COMPANY
R. A. Graves,
Purchasing Director
P. O. Box 679 Kansas City 10, Mo.

FOR SALE
2—50 KVA Transformers
2400/240-480 Volts
2 2½% Taps above—2 2½% Taps below
Fort Payne Improvement Authority
P. O. Box 150 Fort Payne, Alabama

MOTORS, GENERATORS, TRANSFORMERS
1 – 1500 H.P.
Bought and Sold New and Rebuilt
ELECTRIC EQUIPMENT CO.
ROCHESTER 1, N. Y.

WANTED

WANTED TO BUY

3, 333KVA, 1 phase, 60 cycle, 13800/23900Y to 2400 Volt Transformers.
DAHLBERG
LIGHT AND POWER CO., INC.
Solon Springs, Wis.

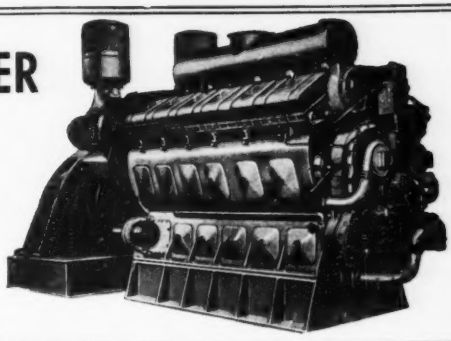
IF THERE IS
Anything you want
that other readers of this paper can supply
OR—
Something you don't want
that other readers can use, advertise it in the
Searchlight Section

DIESEL ELECTRIC POWER

FOR

IMMEDIATE DELIVERY

UNIT CAPACITIES—10 TO 1420 KVA
A. C.—50 AND 60 CYCLES
ANY VOLTAGE



A PARTIAL LIST OF OUR INVENTORY

KVA	Make	Model	HP	RPM	KVA	Make	Model	HP	RPM
1420	Fairbanks Morse	38D8⅛	1600	720	375	Enterprise	DSG-6	450	450
1250	General Motors	16-278A	1600	720	312	General Motors	8-268A	450	1200
1000	General Motors	12-278A	1200	720	187	Ingersoll Rand	S	225	514
937.5	General Motors	12-567	1100	720	125	General Motors	3-268A	150	1200
625	Alco	6-12½x13	750	600	75	General Motors	6043C	90	1200
425	Baldwin	VO-6	510	450	62	Int'l Harvester	UD-18	76	1200

WRITE FOR COMPLETE INFORMATION

Engineered AGSCO DIESEL POWER

A. G. SCHOONMAKER Company, Inc.

ESTABLISHED 1896

Diesel Engines • Power Machinery

ENGINE DIVISION **50 CHURCH STREET, NEW YORK 7, N. Y.**

TEXTOLITE TUBING

Equivalent NEMA Grade XX Rolled Phenolic Laminated Tubing. High dielectric strength, low power factor, high insulation resistance. Light in weight, structurally strong, chemically inert. Manufactured for the Government by General Electric and now surplus. Offered either with plain ends, or threaded and coupled with couplings of like material. Priced at a low fraction of original cost allowing use as piping. Size 4 9/16 ID with ¼" wall. A free sample of material with additional information on request.

Irrigation Division
Veg-Acre Farms
Forestdale, Cape Cod, Mass.

FOR SALE

1500 feet new 2 Conductor

#6 (19 x 0372) Semicon tape 10/64 oiolite, 4/64 Okoprene Cabled and bound to 3 x 9 extra high strength copperweld messenger with 250 x 030 copper binding tape. Never been removed from original reel.

Fort Payne Improvement Authority

P.O. BOX 150
FORT PAYNE, ALABAMA

FOR SALE—*New*

3 – TRANSFORMERS

WESTINGHOUSE

46 KV, 60 cycle, oil-filled, self-cooled Potential Transformers—2 bushings, full voltage—330/1 turn—38,000/115 V. These transformers never used — original cost $1,001.00. Reasonable offer accepted.

Write Purchasing Department of

RAILWAY and INDUSTRIAL ENGINEERING CO.
GREENSBURG, PA.

Power Equipment

Released by Utilities & Industrials

Turbines, Generators, Steam and Oil Engines, Boilers, Motor Generators, Rotaries, Transformers, Motors, Compressors, Induction Voltage Regulators, Oil Circuit Breakers, etc.

Service backed by 40 years' experience

BREW, WOLTMAN & CO.

52 Church St., New York 7, N. Y.

TRANSFORMERS—60 CYCLE

	KVA	Make	Type	Ph.	Voltages
3—	2666	Whse.	OISC	1	66000x13800
2—	2500	G. E.	DTQ	1	13200x3300
1—	2500	Al. Ch.	OISC	3	13200x2300
1—	2500	Pack.	AT	3	13800x2300
3—	1250	G. E.	HVDDJ	1	6600x550
3—	1250	Maloney	C	1	4160x240/480
2—	1000	G. E.	HTI	3	13200x480
3—	1000	Pitts.	OISC	1	13200x2300
1—	750	Whse.	OISC	3	33000x2300
1—	600	Al. Ch.	OISC	3	2300/4000x216
1—	600	Penn.	OISC	3	13200x120/208
2—	500	Whse.	OISC	3	13800x230/460
3—	333	G. E.	OISC	1	33000x2300
3—	333	Pitts.	OISC	1	26400x2600
6—	167	G. E.	HS	1	2400x240/480

BELYEA COMPANY, INC.

51 Howell Street, Jersey City, N. J.

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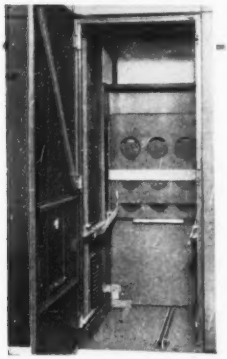
Are You *Really* Interested in Getting More for Your Money?

For years, I-T-E has maintained leadership in the circuit breaker and switchgear industry. Today, I-T-E invites you to look over the special built-in features which have become a part of its "standard price" switchgear . . .



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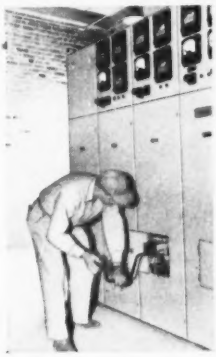
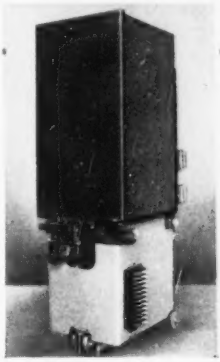
ACCESSIBILITY



PLANNED FOR EASIER
HANDLING

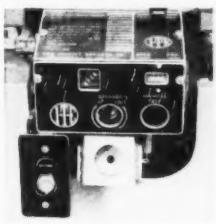


PLANNED FOR GREATER
SAFETY

METERS AND RELAYS are mounted on a *Relay Panel* designed for that specific purpose. Why?

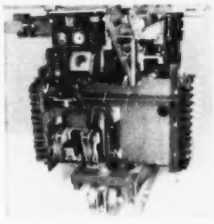
a. Delicate relay mechanisms are not subjected to "operation by vibration" when circuit breaker doors are opened or closed or bumped.

b. The Relay Compartment is just that. The secondary wiring, control bus, and relays are together, *where you want them*, not where manufacturing economy dictates.



TESTING CIRCUIT BREAKER operation within the structure is no longer a chore.

a. Release a catch, move the breaker $4\frac{1}{2}$ inches, and you are ready to test. An electrical close-trip test-switch is furnished on every breaker unit. Test control circuits are automatically set up. No jumpers, no plugs, no push, no pull. Easy does it!

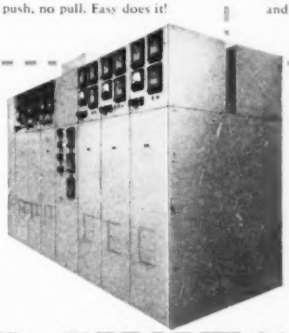


HIGH IMPULSE CIRCUIT BREAKERS

If you are impulse conscious you are familiar with the present interim test that permits circuit breakers of the 5KV class to be subjected to a 45KV impulse test across the open contacts. Type HV breakers are tested to withstand a 60KV impulse — phase to phase, phase to ground, and across the open contacts.

COORDINATED IN MULTUMITE BOARDS

I-T-E HV MULTUMITE Switchgear assemblies coordinate efficient I-T-E HV Air Circuit Breakers with transformers, meters, bus, and instruments into a single, efficient unit. I-T-E HV Air Circuit Breakers are rated at 5KV, 7.5KV, and 15KV — 600 A., 1200 A., and 2000 A. continuous; 50MVA, 150MVA, and 250MVA interrupting.



These are but a few of our better points. There is an I-T-E Field Application Engineer in your area. Permit him to tell you of other advantages, and to assist in your switchgear planning.

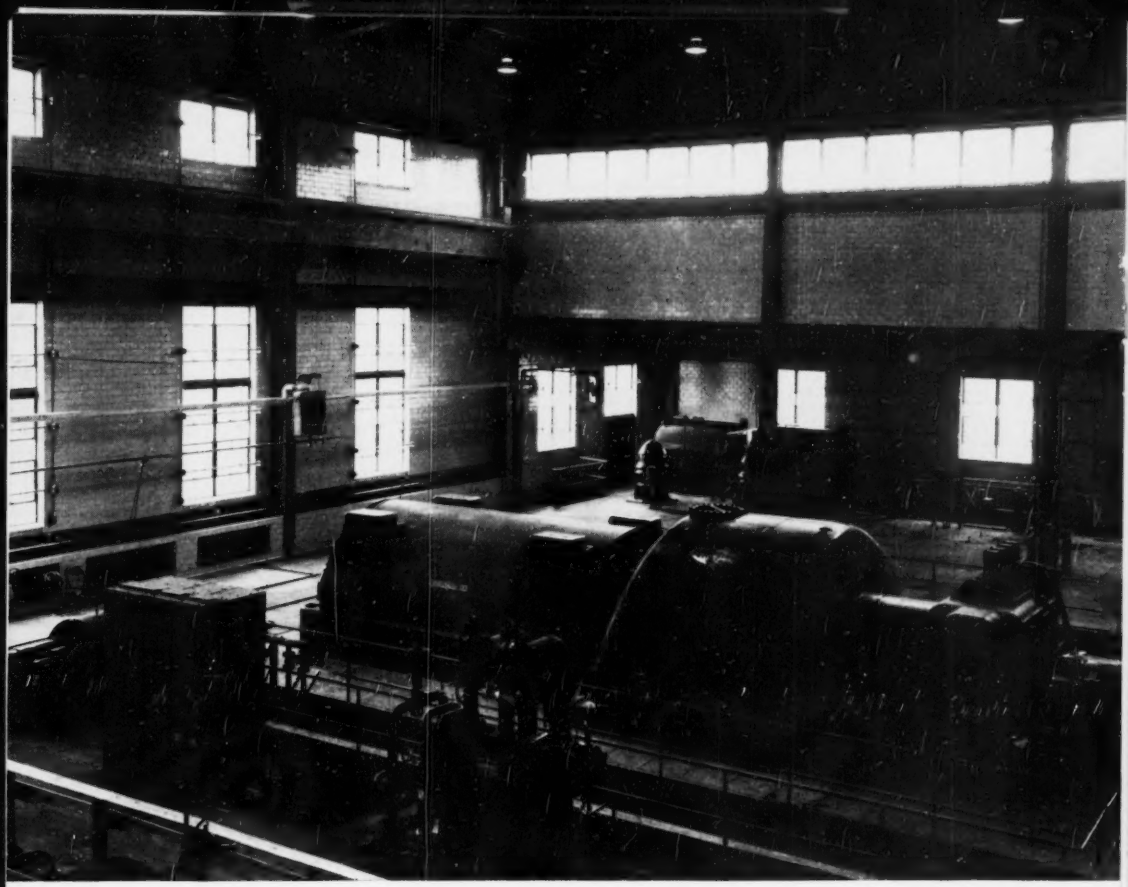
POWER SWITCHGEAR

I-T-E CIRCUIT BREAKER COMPANY, 19th & Hamilton Streets, Philadelphia 30, Pa.
31 Offices in United States · In Canada, EASTERN POWER DEVICES, Ltd., TORONTO
For Export: Philips Export Corp., New York

SWITCHGEAR • UNIT SUBSTATIONS • ISOLATED PHASE BUS STRUCTURES • POWER CIRCUIT BREAKERS
MECHANICAL RECTIFIERS • RESISTORS • SPECIAL PRODUCTS

R&IE

* For power switching equipment refer to Railway & Industrial Engineering, an I-T-E organization



Young turbine with a bright future . . .

● OFFICIALS of a midwest power company have every reason to believe that their new 40,000-KW turbine, shown above, will never have to be shut down for oil replacement, oil system cleaning, or because of oil acidity troubles. Their convictions are based on their own experience with Nonpareil Turbine Oil.

Since 1940, this company has put Nonpareil Turbine Oil into five big turbines, including the new unit. These five turbines have a total capacity of 188,500 KW. During the *one to nine years of operation* on Nonpareil, neutralization numbers have stayed below .06 mg. KOH/gm. There have been no time losses or troubles caused by high acidity. Oil systems have not required cleaning. Such benefits are assured this company, not only for 8 or 10 years, but for the *life* of its turbines. This assurance is based on Nonpareil's written guarantee that it will maintain a neutralization number below 0.15 mg. KOH/gm.

Why not end oil system maintenance and oil-acidity troubles, once and for all, by using Nonpareil Turbine Oil in your turbines? For more evidence of these savings, ask a Standard Oil Lubrication Engineer to supply you data from 20-year service records of Nonpareil Turbine Oil.

Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

NONPAREIL
Turbine Oil

"Will outlast your turbine"

STANDARD OIL COMPANY (INDIANA) STANDARD